Cruachan Expansion Project – Further Environmental Information & Clarifications

December 2022

The Electricity Works (EIA) (Scotland) Regulations 2017

Application For Consent Under Section 36 of the Electricity Act 1989 For Construction And Operation Of The Cruachan Expansion Project Within The Planning Authority Of Argyll And Bute Council

Supplementary Environmental Information and Further Clarifications

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Introduction

This note has been produced for the purpose of presenting the information used in addressing the comments raised by consultees to the Section 36 application mentioned above (ECU00004492) and, in particular, the Environmental Impact Assessment Report (EIAR) that supported the submission. The application was submitted by Drax Cruachan Expansion Limited ('the Applicant') to the Energy Consents Unit (ECU) on 17 May 2022. In June 2022 consultees were invited to comment on the proposals.

All statutory consultees and any organisation likely to be concerned by the proposed development were requested to consider the application and the EIAR. As a result of that exercise a number of representations were submitted, some of which requested further information or clarifications from the Applicant.

This note summarises the comments received from consultees and indicates how the Applicant has addressed these comments. The note appends a number of technical documents and correspondence which has been issued to relevant consultees and the ECU since the application was submitted. Table 1.1 presents a summary of such information, and the appendices provide the information in full.

Supplementary Information and Further Clarifications

In accordance with The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, where Scottish Ministers seek further information from the developer about any matter mentioned in Schedule 4 of the EIA Regulations, which in the opinion of the Scottish Ministers is directly relevant to reaching a reasoned conclusion on the significant effects of the development on the environment, this must be provided by the developer as "supplementary information".

Scottish Ministers or consultees may also request clarifications or further supporting information to assist in their understanding of the proposals and the impact these may have. Where this has been requested, the Applicant may provide, for example, a simple clarifying response by way of email, or may need to provide additional or amended drawings to assist the consultee.

This note provides appendices of all supplementary and further information that the Applicant has shared with consultees since the original application documentation was submitted in May 2022.

Information Summary

Table 1.1 summarises the consultation comments received and indicates what has been submitted by the Applicant to address these. A brief summary of the documentation submitted is also provided.

All further information and documentation shared with consultees is presented in the following appendices.

Appendix 1 – Ground Conditions

Appendix 2 – Cultural Heritage

Appendix 3 - Ecology

Appendix 4 – Transport and Access

Appendix 5 – Scottish Forestry

Appendix 6 – BT

Appendix 7 – Argyll District Salmon Fishery Board

Appendix 8 – Public Representations

Conclusions

No design changes have been proposed as a result of the consultee comments or Applicant's responses.

The supplementary information and further clarifications have not led to any alteration to the conclusions on likely significant impacts reported within the original EIAR.

Table 1.1 – Summary of Supplementary and Further Information

Consultee	Consultee Comment	Supplementary Information and Clarifications Submitted by Applicant	Summary of Information
SEPA	EIAR Appendix 6.2 of EIA Report, Outline Peat Management Plan is missing from submission.	Appendix 6.1 Peat Management Plan (issued 29.06.22)	The Outline Peat Management Plan assesses the potential impact of the Proposed Development on existing peat deposits within the site boundary and to provides the basic peat management principles that will be incorporated into later stages of development.
	Further information requested in relation to hydrogeological/ groundwater issues, site ecology and flood risk.	Holding Objection Response (issued 08.11.22)	- Provided signpost to where information on private water supplies was assessed in the EIAR. - Discussion on Acid Rock Drainage and at what stage more detail could be provided on this. - Information on how groundwater dependent flush habitats have been considered and recorded, and how these habitats can be protected. - Commitment to a full Habitat Restoration and Landscape Mitigation Plan. - Impact of proposed lower site compound and the impact any excavations may have on peat deposits. - Update to Outline Peat Management Plan after reconsidering volume of peat. Commitment to provide a final Peat Management Plan at detailed design stage to present peat volumes and reuse/restoration strategy. - Further clarification on the flood-wall design at the proposed quayside. Confirmation that the Scheme would not operate during a 1 in 200 year flood event.
	Request for 'Cruachan 2 – Potential Acid Generating Geology Site Visit – Report' (as (referred to within Section 1.7.3 of EIAR Appendix 6.1)	Potential Acid Rock Generating Site Visit Report (issued 23.11.22)	Report was provided to SEPA. The document presents the summary of a site visit and associated opinion with regards to preliminary Acid Rock Drainage risk for the Cruachan 2 excavations.
Historic Environment Scotland (HES)	Further information required in relation to built heritage considerations and impact on heritage assets.	Cultural Heritage EIAR Addendum (issued 16.12.22)	The addendum sets out the heritage significance of the designated heritage assets identified along with any contribution made by their setting. It then goes on to consider the potential impacts of development within the legislative and policy context. Is supports the original Cultural Heritage EIAR Chapter 12.
NatureScot	Requested full details of the track construction which show how much of the SAC designation will be impacted, including loss of habitat to slope	Clarification note and updated drawings (issued 15.08.22)	Technical note describing how the calculations of predicted habitat loss along the dam access road had been made, including illustration of this.

	stabilisation as well as to track construction.		
		Clarification email (issued 26.08.22)	Provided details of how much habitat will be lost overall to slope stabilisation along the length of dam access road, how road stabilisation will be achieved and how much ground within the SAC will be impacted by these works. Updated drawings were provided.
		Cross Sections, Road Widening Drawings, SAC Impact Clarifications Report (issued 25.10.22)	Technical drawings provided to show the areas where road widening may encroach into the SAC designated area. Cross sections to show horizontal alignment of the proposed works at key areas along the road. Provided updated calculations on the likely areas of habitat loss as a result of the road widening proposals.
		Construction Traffic Response Letter (issued 17.11.22)	Details of the predicted number of construction vehicles that will use the existing dam access road.
Transport Scotland	Requested update and clarification on a number of elements relating to the proposals.	Response table (issued 22.09.22)	Table provides further clarification and response on: - Spoil volumes and removal. - Impact/damage to trunk road from HGV movements. - Discussion on A85 temporary diversion options and preferred approach. - Slope stability between A85 and railway. - Construction method for tunnelling under the A85. - Clarification on works that will be underground. - Ground investigation and Geotechnical certification. - Details on abnormal load movements. - Clarification on proposed construction programme. - Discussion on specific access proposals from the A85. A number of technical drawings are appended to assist in understanding the responses.
		Meeting Notes and Materials Handling Plan (issued 10.11.22)	Summary of meeting where issues in the response table (as above) were discussed. A revised Materials Handling Plan was prepared and shared with the consultee. This provided further commentary on the options for removing the excess excavated construction material and the consideration of adopting marine and rail-based transport solutions.
Scottish Forestry	Requested information on where woodland loss is summarised and identified on a map, and where the compensatory planting scheme is discussed and mapped.	Email response (issued 28.07.22)	Confirmation that there is no proposed loss of woodland and therefore a standalone woodland and forestry chapter has not been prepared as part of the EIA. Information as to where impact on woodland and trees had been presented in the EIAR.

BT	Requested details of any new structures proposed, including heights and grid references so assessment could be made whether there would be any interference to BT's radio network.	Email response provided (issued 07.11.22)	Provided grid references and technical information on the gate hoist structure that will be 13m high, located near to the existing dam structure.
Argyll District Salmon Fishery Board	Requested further information on fish mitigation measures.	Response note (issued 17.10.22)	This response discusses issues raised: - Fish survey work undertaken to date. - Impact on fish. - Salmonid population of Cruachan Reservoir. - Mitigation measures to protect fish.
Members of Public – Representation 001 & 002	Points raised regarding noise impact and use of St Conan's Rd and Dam Access Road for construction phase.	Response letter (issued 17.11.22)	Provides detail on how the noise assessment has been undertaken and the predicted impact on residential properties. Agreement to investigate potential to relocate an existing cattle grid on the dam access road/St Conan's Road.

Further Environmental Information

Appendix 1 Ground Conditions

Cruachan Expansion Project – Outline Peat Management Plan

1 Introduction

1.1 Report Background

1.1.1 This report has been prepared to support the Section 36 application for the proposed Cruachan Expansion Project (hereafter referred to as The Proposed Development). The objective of the report is to assess the potential impact of the Proposed Development on existing peat deposits within the site boundary, and to provide the basic peat management principles that will be incorporated into later stages of development. The location of the Site is shown in **Figure 1**.

1.1.2 This report is an outline plan incorporating the data collected to date. The design of the above ground infrastructure which will have the potential to impact peat is at a preliminary design stage. During the future detailed stage, further data collection will be undertaken, and this report will be updated to a final peat management plan.

1.2 Proposed Development

1.2.1 The Proposed Development seeks to optimise use of the existing Cruachan Reservoir and Dam through development of a new underground power station and associated infrastructure adjacent to Cruachan power station, on the northern banks of Loch Awe in Argyll and Bute, to provide up to 600 megawatts (MW) of additional generating capacity. The Proposed Development will be operated independently of the existing 440 MW Cruachan 1 power station. Both power stations will use Loch Awe as the lower reservoir and Cruachan Reservoir as the upper reservoir. For the purposes of this assessment the Site has been divided into three sections:

- 'The West Area' comprising the existing Cruachan 1 Power Station and the Proposed Development, including the upper compound area, new intake structure at Cruachan reservoir, below ground works (headrace and tailrace tunnels, access tunnels, waterways, powerhouse cavern), inlet and outlet structures and the new quayside along the northern shoreline of Loch Awe.
- 'The Access Track' comprising the existing access road routing from the A85 to the upper reservoir via St Conan's Road which will be upgraded; and
- 'The East Area' comprising a lower construction compound area off the A85 east of Lochawe.

1.2.2 A site location plan is included on **Figure 1**.

1.2.3 For ease of reference, the following terms have been used in this report:

- EIA – Environmental Impact Assessment;
- The Applicant – Drax Cruachan Expansion Limited;
- The Site – the area of land to the east of the existing Cruachan Power Station (Cruachan 1) where the Proposed Development will be located;
- The Proposed Development – the development of a new underground power station and associated infrastructure adjacent to Cruachan 1, as described in Chapter 3 of the EIA Report– The Proposed Development;

- The EIA Regulations – the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017. These regulations are directly applicable to this EIA for the Proposed Development;

- Cruachan 1 – the existing 440MW pumped storage hydro Cruachan Power Station

1.3 Scope of Work

1.3.1 The Proposed Development has been determined as requiring an Environmental Impact Assessment (EIA), and this report provides the concepts of the mitigation measures for the Site, in relation to Peat.

1.3.2 It is a SEPA requirement that proposed development in areas of Peat occurrence should be accompanied by a Peat Management Plan (PMP) whose guiding principles are to protect and preserve the Peat as far as is reasonably practicable and provide a quantitative assessment of the volumes of Peat affected by the proposed development. There is guidance provided in 'Developments on Peatland', (SEPA 2012) regarding the typical contents of a PMP.

1.4 Consultation

1.4.1 SEPA have been contacted for environmental information about the Site on several occasions during the EIA assessment, the most recent being on 5th April 2022. The project team continue to seek a response to this request with a view to making a more robust assessment. Unfortunately, it is understood that freedom of information requests to SEPA are currently on hold due to the December 2020 cyber-attack.

1.4.2 The outline PMP is based on preliminary, site-specific information available at the time of writing, with the final PMP to be undertaken at the detailed design and construction stage and subject to discussion and approval by SEPA prior to implementation.

1.5 Related Documents

This report should be read in conjunction with related documents based on studies of the site:

- Cruachan Expansion Project – Preliminary Investigation Report on Ground Conditions (Contamination and Stability) Environmental Impact Assessment Appendix 6.1, Stantec, 2022

- Cruachan Expansion Project – Environmental Impact Assessment, in particular Chapters 3 (Site Description), 8 (Ecology) and 9 (Ground Conditions), Stantec, 2022

2 Peat Background

2.1 Definition & Formation of Peat

2.1.1 The definition of Peat provided in Guidance on Developments on Peatlands (SG, 2017) is as follows; "peat soil is an organic soil which contains more than 60 per cent of organic matter and exceeds 50 centimetres in thickness".

2.1.2 Peat is a type of soil which forms under water-logged conditions from dead plant material and accumulates where rainfall is high and evapotranspiration losses are low. Peatlands in Scotland are mainly blanket bogs with the largest areas located in the Highlands and Western Isles.

2.2 Description of Peat

2.2.1 The soil profile of Peat is composed of two main zones: the acrotelm and catotelm.

2.2.2 The acrotelm is the upper more fibrous layer above the level of the permanently saturated Peat, comprising a matrix of living plants and recently deposited dead material.

2.2.3 The catotelm is the lower permanently waterlogged Peat that exists in an anaerobic environment (Marsden and Ebmeier, 2012) and is generally unable to withstand any excavation and handling without complete disintegration.

2.3 Carbon and Ecology

2.3.1 Peat can hold large quantities of carbon that is poorly protected, which means that excavation of Peat can lead to large carbon losses/emissions. Maintaining peatlands in good condition can reduce net greenhouse gas emissions as peatlands are able to sequester further carbon dioxide. However, degraded peatlands release stored greenhouse gases as the exposed peat decomposes. Furthermore, Scottish peatlands support many species of European importance and play a key role in upland water systems (Marsden and Ebmeier, 2012).

3 Policy and Guidance

3.1 Guidance

3.1.1 The following guidance has informed this assessment

- SEPA Regulatory Position Statement – Developments on Peat, SEPA, 2010.
- Developments on Peatland: Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste, SEPA, 2012.
- Developments on Peat and Off-Site Uses of Waste Peat, WST-G-052, SEPA, 2017; and
- Peatland Survey. Guidance on Developments on Peatland, on-line version only. Scottish Government, Scottish Natural Heritage, SEPA, 2017.

3.2 Peat Management Hierarchy

3.2.1 SEPA (2010) state that 'Developments on peat should seek to minimise peat excavation and disturbance to prevent the unnecessary production of waste soils and peat.'

3.2.2 SEPA (2012) states that it is required to demonstrate that the extent of the peat at the site has been investigated. Furthermore, it is necessary to show:

- how, through thorough site investigation and iterative design, the proposed development has been structured and designed to minimise, so far as reasonably practicable, the quantity of peat which will be excavated.
- that volumes of peat anticipated to be excavated by the proposed development have been considered; and
- how excavated peat will be managed.

The peat management hierarchy is summarised in table 1 below.

Table 1: Peat Management Hierarchy

Peat Management Hierarchy	Use	Restrictions / Limitations
Prevent Creation of Waste Peat	Minimise peat excavation and disturbance to prevent the unnecessary production of waste peat using a Peat Management Plan.	
Re-Use on site Re-Use off-site for peatland restoration.	Use of peat on-site in construction or reinstatement e.g., restoration of hardstanding areas, borrow pits, road verges, peatland restoration etc. or off-site to restore peatland areas.	Depends on the physical nature of the peat. Use of unsuitable material and/or excessive quantities (i.e., more than needed) will be regarded as disposal and will require an environmental authorisation. Off-site use will require an environment authorisation.

Recycling/Recovery	Where peat cannot be re-used on site or off site for peatland restoration it may be spread on land for agricultural benefit, recycled through blending with other materials to form a soil substitute or used in other relevant works.	Will require a waste management licence or registration as an exempt activity and compliance with the legal requirements.
Disposal	Off-site disposal of surplus Peat	Only after all other options have been explored and discounted. Liquid peat cannot be landfilled without pre-treatment.

Prevention

3.2.3 SEPA (2012) outlines the guiding principles for preventing disturbance and reducing peat excavation at the design stage, these are presented below:

- "Position site infrastructure in areas of shallower peat, or design appropriate engineering solutions to avoid or minimise peat excavation."
- "Minimise infrastructure that could impact peat."
- "Minimise the detriment to peat if excavation cannot be fully avoided."
- "Prevent peat displacement from the development of borrow pits."

Reuse

3.2.4 SEPA (2012) states that the key guiding principle for re-use is "to only re-use Peat where it is suitable for the identified and required use", and that "careful handling is essential to retain any existing structure and integrity of the excavated materials and thereby maximise the potential for excavated material to be reused". This document also provides several principals which should be considered at all stages relating to the reuse of peat:

- Minimise plant movements and haul distances in relation to any earthworks activity including peat management.
- Develop appropriate temporary storage areas for excavated peat close to the excavation. Suitable storage areas are more appropriately sited in areas with lower ecological value and low stability risk.
- Reuse should occur as soon as possible after excavation where practicable.

Storage

3.2.5 SEPA (2017) states that "care must be taken to ensure that peat storage does not cause environmental pollution" and that the peat must be used as soon as possible after excavation. If excavated peat is stockpiled without any certainty of use or becomes unsuitable it will be classified as waste. Furthermore, "if waste peat is stored on or off site, prior to treatment or recovery, for more than three years (or where storage prior to disposal is for more than one year) then it is likely to constitute a landfill and a Pollution Prevention and Control Permit (PPC) will be required".

3.2.6 Further discussion of temporary peat storage is given in **Section 6.8**.

4 Site Context

4.1 Site Location

4.1.1 The Site is located approximately 21km east of Oban and around 4.5km west of Lochawe village on the northern banks of Loch Awe and to the north of the A85 in Argyll and Bute. The nearest postcode to the Site at the Cruachan Visitor Centre is PA33 1AN and the existing Cruachan 1 pumped storage hydro scheme is located at national grid reference (NGR) NN 080 277. The location of the site is presented in **Figure 1**.

4.2 Site Topography

4.2.1 In the north and west of the Site, the Cruachan Reservoir and the base of Cruachan Dam are located within Coire Cruachan which is approximately 400m above Ordnance Datum (AOD) according to OS mapping. The ground levels fall steeply in a southerly direction from the base of the dam wall (390m AOD) to the A85 at approximately 40m AOD.

4.2.2 Land to the north and south of the access track is generally steep (45% in areas) until the access road meets the village of Lochawe.

4.2.3 The area being considered for the lower compound area (north-east of Lochawe and the A85) has a hummocky nature and is overall relatively flat lying with a slope falling to the southeast in the southwest corner.

4.3 Published Geology

4.3.1 The BGS GeoIndex Onshore mapping and the 1:50,000 scale geological series Scotland, Dalmally, Sheet 45E (BGS, 1992) indicate the following geological sequence underlying the Site:

Superficial Deposits

4.3.2 The Site is largely shown to be absent of superficial deposits suggesting that bedrock is at or near to the surface.

4.3.3 The far north of Cruachan Reservoir and the East Area are shown to be underlain by Hummocky (Moundy) Glacial Deposits described by the BGS as 'Lithologically diverse and complex glacial deposits that have characteristic moundy topographic form. Composed of rock debris, clayey till and poorly- to well-stratified sand and gravel'.

Solid Geology

4.3.4 The published BGS geological mapping indicates that the Proposed Development is located on the contact between the Dalradian Group of metasediments known as Ardrishaig Phyllite Formation of Neoproterozoic age to the southwest, and the late Devonian Quarry Intrusion to the northeast which is part of the Etive Pluton. This contact is observed at the Site in surface outcrops and within existing underground workings within Cruachan 1 as a change from a Phyllite to a Quartz-Diorite across a contact zone where apparent xenoliths of the country rock (phyllites) were present within the Quartz-Diorite. The following units are also present:

- Lorn Plateau Volcanic Formation – Andesite and Basalt described as mainly basalts, including orthopyroxene-bearing types, with rare rhyolites, dacites, tuffs, agglomerates and some intercalated conglomerate.

- Ardrishaig Phyllite Formation - Quartzite, Metalimestone and Phyllitic Semipelite across the southwest of the Site in the area of the tunnels and new jetty.
- Quarry Intrusion – Quartz-Diorite in the area of the upper compound area.
- Monzodiorite Facies, Cruachan Intrusion in the far north of Cruachan Reservoir.
- The access track routes through the Easdale Slate Formation – Pelite, Graphitic and the Islay Quartzite – Semipelite; and
- Glen Coe Quartzite Member – Quartzite beneath the lower compound area.

4.4 Peat Deposits

East Area

4.4.1 Initial peat probing of the East Area (proposed Lower Construction Compound Area) on a 100x100m grid was undertaken by Stantec during a Site walkover in March 2022 to provide a preliminary understanding of the presence and extent of peat at the East Area. Peat depths were generally found to be shallow and between 0.0m to 0.5m below ground level (bgl) however some areas of localised deeper peat were encountered particularly in the northern corner of the East Area to depths of more than 2m bgl. In the central portion of the East Area, peat depths were up to 2m bgl. These results are shown on **Figure 2**.

West Area

4.4.2 For the West Area at the lower inlet/outlet it was confirmed that no peat is present due to the presence of existing Cruachan 1 infrastructure, road and railway, very steep slopes and bedrock at surface.

4.4.3 For the West Area at the upper compound area it was confirmed that in-situ peat is not present. During the walkover it was observed that the ground conditions at the proposed upper compound area presently comprise a thickness of soft mixed made ground material comprising organic soil with sand, gravel and cobbles. It is understood that in-situ soil was removed at this location to form a temporary compound area for a recent filming project at the location.

Access Track

4.4.4 For the margins of the existing access road routing from the A85 to the upper reservoir was confirmed that no peat is present due to the presence of the access track make up, very steep slopes and bedrock at surface.

4.5 Hydrological Setting

4.5.1 The site is bounded to the south by Loch Awe and in the far east of the site by the mouth of the River Orchy where it meets Loch Awe.

4.5.2 Allt Cruachan enters the Site from the north, flows southwards into Cruachan Reservoir, then from Cruachan Reservoir south to Loch Awe.

4.5.3 Several small watercourses also pass through the Site broadly flowing southwards with the topographic gradient.

4.6 Ecological Setting

4.6.1 The Glen Etive and Glen Fyne Special Protection Area is present on site to the west of Allt Cruachan and around Coire Cruachan excluding the Cruachan Reservoir.

4.6.2 The Loch Etive Woods Special Area of Conservation and Coille Leitire Site of Special Scientific Interest covers an area of the site to the north of the existing railway line at the southwest of the site within the West Area, and immediately to the south of the central section of the Access Track.

4.6.3 The Cruachan Reservoir Geological Conservation Review site covers the upper compound, gate shaft and upper access track areas within the West Area of the site.

5 Site Investigations

5.1 Scope and Findings

Initial Peat Probing

5.1.1 Initial peat probing at a 100x100m grid spacing was undertaken by Stantec during the Site walkover to provide a preliminary understanding of the presence and extent of peat at the limited areas of above ground development included within the outline design of the Site.

5.1.2 As described above, peat was shown to be present at the East Area of the site including within the area of the proposed lower construction compound area.

5.1.3 Peat / organic soil depths were generally found to be shallow and between 0m to 0.5m below ground level (bgl) however some areas of localised deeper peat were encountered particularly in the northern corner of the East Area to depths of more than 2m bgl. In the central portion of the East Area, peat depths were up to 2m bgl.

5.1.4 As described above, for the West Area at the lower inlet/outlet it was confirmed that no peat is present due to the presence of existing Cruachan Power Station infrastructure, road and railway, very steep slopes and bedrock at surface. For the West Area at the upper compound area it was confirmed that no in-situ peat is present.

Detailed Survey of East Area

5.1.5 A detailed peat survey was commissioned by Stantec at the East Area being considered for the lower compound area and is summarised in **Section 6** below.

5.1.6 SKF Ltd, under the technical direction of Stantec, conducted the Detailed Peat Survey on the lower compound area during April 2022 to provide information on the extent and nature of the peat deposits across the site and comprised the following:

- 907 full depth peat probes.
- 21 peat samples by Russian Corer with description of the soil core column including surface firmness, Von Post classification, fibre description and shear strength by hand vane.
- Laboratory testing to determine the moisture content, bulk and dry density, organic content of the peat material.

5.1.7 The peat depths across the site area at each of the 907 positions are displayed in **Figure 2**.

Summary

5.1.8 These investigations confirmed that a layer of peat or thin organic soil is present across the East Area (proposed lower compound area). The peat was recorded to be variable in thickness across the Site, ranging up to a maximum thickness of 2.20m at a single location, a general peat depth of <1.00m has been encountered.

5.1.9 No peat was encountered at the areas of above ground infrastructure in the West Area or Access Track area.

5.1.10 The results are presented in the Peat Baseline section below.

6 Peat Management

6.1 Peat Baseline

Peat Survey

6.1.1 During the Peat Probing Study (SKF, 2022) a total of 907 locations were probed across the proposed lower construction compound area in a 10m x 10m grid to determine the thickness of peat. The extent of peat coverage and depth of peat across the site is shown in **Figure 2**.

6.1.2 **Table 2** summarises the number of locations and the corresponding percentage of the total results for each depth category. As described in section 1.2 above, in analysis of the probing results, peat is considered as the probe locations with a depth greater than 0.5m, whilst organic soil is considered as those probe locations less than 0.5m (SG, 2017).

Table 2: Summary of Organic Soil and Peat Depth Probing Results.

Surveyed organic soil depth, m	Number of probe points	Percentage of total probe points
<0.5	705	77.73%
Surveyed peat depth, m	**Number of probe points**	**Percentage of total probe points**
0.5 – 1.0	140	15.44%
1.0 – 1.5	52	5.73%
1.5 – 2.0	9	0.99%
2.0 – 2.2	1	0.11%

East Area

6.1.3 In general, the majority (over 77%) of the proposed lower construction compound area was found to be covered with organic soil with a depth less than 0.5m. Areas of peat are located in pockets generally associated with topographical lows associated with the hummocky terrain present on site. The thickest pockets of peat are localised and distributed across the site, with the majority located towards the northern boundary of the site and the topographical low to the eastern centre of the site. Peat was encountered in these areas from 0.5m bgl up to a maximum depth of 2.20m bgl. Deep peat greater than 1.0m was found only at 6.8% of the site probe locations across the whole site area.

Western Area and Access Track

6.1.4 No peat was encountered in these areas.

Peat Classification

6.1.5 The peat deposits were generally recorded as dark brown pseudo-fibrous Peat with roots.

6.1.6 A von Post classification of the deeper areas of peat showed a range of H6 to H8. This indicates that the peat is moderately decomposed to strongly decomposed.

6.1.7 The acrotelm is the fibrous surface to the peat bog, which exists between the growing bog surface and the lowest position of the water table in dry summers. Much of the peat found on the site is classified as upper acrotelm, slightly decomposed with some fibrous content and moderate water content up to about 1.0 m in depth. This material would be suitable for reuse for landscaping purposes in open space areas without the need for any engineering measures.

6.1.8 The deeper peat generally in excess of 1.0 m is classified as the catotelm, moderately to strongly decomposed with a high fibrous content and moderate water content. The outline site design process has ensured that the layout avoids the requirement for excavation of the catotelm as much as reasonably practicable.

6.1.9 The peat is generally flat lying with very little hagging associated with it.

6.1.10 The area considered for the lower compound area site is predominantly modified peatland with a known history utilised as a construction compound for Cruachan 1, grazing by sheep and cattle, and small areas of bare peat.

6.2 Avoidance of Deeper Areas of Peat

6.2.1 Peat with depths in topographical depressions ranging from 0.5m bgl to 2.2m bgl is encountered locally across the lower compound area. In order to minimise the volume of peat being excavated on site, areas of deeper peat have been avoided within the design of the site. Much of the site infrastructure is located in areas of peat with depths less than 1m.

6.2.2 The evolution of the development design considered the need for borrow pits and by careful design has allowed tunnel spoil reuse so that borrow pits can be excluded from the design. Thus the prevention of peat displacement by excluding the development of borrow pits has been incorporated within the design of the development.

6.3 Peat Excavation

6.3.1 The first principle of peat management is to prevent the loss of peat habitat wherever possible (See **Table 1**). This section sets out the measures used to minimise the loss of peat habitat and the expected peat excavation volumes.

6.3.2 During construction of the Proposed Development, all reasonable measures will be taken to avoid or minimise excavations and minimise disturbance of peat and peatland habitats. Ground disturbance areas around excavations will be kept to a minimum and will be clearly defined on site through a Construction Environmental Management Plan (CEMP) and Risk Assessment Method Statements (RAMS) for the works. Access to working areas during construction will be restricted to specific routes, which will be within the portion of the site comprising the development envelope required for the construction of the above ground infrastructure.

6.3.3 Robust working practices based on the CEMP and RAMS, appropriate plant and experienced operators will be used to avoid unnecessary disturbance to the ground surface and restrict any disturbance to within the development envelope.

Peat Excavation Estimated Volumes

6.3.4 The table below indicates the peat excavation requirement calculated using data from investigations to date. This calculated volume estimate is considered a worst-case scenario based on the proposed development layout as the calculations assume the removal of the full depth of peat down to the underlying glacial deposits or bedrock strata over the full footprint of the development. Furthermore, all organic soils less than 0.5m thick comprising the majority of the material encountered, have been classified as peat as part of the analysis in this report which is considered a conservative approach.

6.3.5 These preliminary calculations suggest that during the development of the site an estimated 28,900m^3 of peat will require to be excavated to allow the construction of the temporary and permanent above ground elements of the Proposed Development.

Table 3 Peat Excavation Requirement Calculated Using Data from Investigations to Date

Measurement	Peat excavation footprint for site infrastructure
Area, m^2	90,000
Volume, m^3	28,989

6.3.6 Within the detailed design stage final Peat Management Plan, it is expected that actual volume of peat may be substantially smaller subject to data obtained from further investigation and testing and this worst-case position will be reduced.

6.4 Peat Strategy

6.4.1 The peat management strategy for the site can be set out as follows, in order of the hierarchy for management of peat:

a. Avoid and minimise peat excavation. Through the design strategy and evolution process as detailed in Chapter 3 of the EIA Report Volume 1 – Main Report (Stantec, 2022), the site layout has been designed to avoid peat excavation where possible and avoid areas of deep peat as far as is reasonably practicable based on the information available to date.

b. Reuse as much as is practicable on site in heathland restoration and to reinstate development margins.

c. Following full exercise of option b, remove surplus to an off-site location where it can be used in nearby areas. The developer will work with Argyll and Bute Council and local landowners regarding identifying appropriate re-use receptors in the local area. *

*Where this (option c) is not practicable then the ultimate option will be disposal of suitable peat. It is recognised that this disposal option is the worst-case option but that it has been considered by the developer and included in the cost plan for the development.

6.5 On-site Peat Re-Use

6.5.1 Due to the limited extent of above ground works to be carried out during the Proposed Development, it is expected that there are limited opportunities for re-use of excavated peat / organic soil. It is anticipated that limited volumes of peat will be used to reinstate certain areas of the site as follows:

- **Disturbed margins of the development area for infrastructure**. Formation of the limited above ground infrastructure for construction of the development will necessitate disturbed margins around the completed infrastructure of roads, parking areas and compound areas. These disturbed margins will be restored using peat from the site as landscaped open space areas mimicking natural conditions.

- **Restoration of heathland**. The modified nature of the peatland in the eastern area of the site around the proposed compound area has been noted. There may be opportunities for re-use of suitable excavated peat to improve these areas. The Developer will work with the landowner of

this area to maximise on site re-use in this way and set out within the final PMP at the detailed design stage.

6.5.2 Due to the outline stage of design at the time of writing, it is not possible to estimate the quantity of peat which may be re-used on site. During the detailed design stage this will be carried out and the PMP updated.

6.6 Off-Site including Peat Recovery/Recycling

6.6.1 Based on the data available to date at this outline stage of above ground site design it is anticipated that the worst-case position is that the majority of the excavated peat / organic soil may require to be taken off site. As discussed above, the Developer will work with Argyll and Bute Council and local landowners to identify suitable re-use receptors in the local area, and this will be included within the updated PMP and presented to SEPA for approval.

6.7 Peat Handling Method Statement

6.7.1 The excavation of soils will be undertaken to avoid cross contamination between distinct horizons, where possible. This will be detailed within the CEMP. The different soil horizons would be kept and stored separately for re-use.

6.7.2 During and after excavation, storage, haulage and reuse of excavated material will be planned to minimise material movement around the site. Where possible, immediate reuse will be preferred to temporary storage.

6.7.3 Turves will be stripped and handled with care and kept vegetation side up such that damage to the living vegetation mat will be prevented or minimised as far as possible. The condition of stored turves would be monitored for signs of desiccation and deterioration.

6.7.4 Stripped materials will be carefully excavated and separated to keep separate peat types apart and stored in appropriately designed and clearly defined separate stockpiles. Excavated peat will be excavated as turves which should be as large as possible and kept wet in order to minimise desiccation during storage.

6.7.5 Temporary storage may be required where material is not required for immediate reinstatement. This will be detailed in the CEMP. To minimise handling and haulage distances, where possible excavated material will be stored locally to the site of excavation and/or local to the area where it will be required for re-use.

6.7.6 Temporary storage of peat will be located on site, within the disturbed development envelope. The exact storage location(s) will be agreed with SEPA prior to commencement of works and provided on a plan to accompany the updated Peat Management Plan and relevant Method Statements.

6.7.7 Temporary storage locations would be appropriately located and designed to minimise impact to sensitive habitats and species, prevent risks from material instability and runoff into watercourses.

6.7.8 Temporary storage will be isolated from any surface drains and a minimum of 70m away from watercourses, unless otherwise agreed. Storage would include appropriate bunding to minimise any pollution risks where required, stored on geotextile matting to a maximum of 1m thickness.

6.7.9 Peat would not be stockpiled for more than 6 months, unless otherwise agreed with SEPA.

6.7.10 The final method statement will follow the principles detailed below, in accordance with the best practice guidance including SEPA (2017) and SEPA (2012).

Summary

- Temporary storage of peat will be minimised.
- Suitable storage areas will be sited in areas avoiding watercourses, stability risk, groundwater dependent terrestrial ecosystems or other sensitive areas.
- Reinstatement will, in all instances, be undertaken at the earliest opportunity to minimise storage of turves and other materials.
- Timing of the construction work, as much as possible, to avoid periods when the peat materials are likely to be wetter; and
- Transport of peat within the Development site from excavation to temporary storage and restoration site will be minimised.

7 Conclusions

7.1.1 The peat baseline is based on ground conditions encountered during a site walkover peat probing exercise and a subsequent Peat Survey commissioned by Stantec and carried out in April 2022 (SKF, 2022). Measures to reduce the volume of peat excavated based on best practice guidance have been incorporated into the outline design of the Proposed Development (Chapter 3 of the EIA Report Volume 1 – Main Report (Stantec, 2022)) and include the avoidance of above ground development in the deepest areas of peat.

7.1.2 Measures to prevent the loss of peat habitat have been incorporated into the design stage of the Proposed Development through the avoidance of the areas of peat in general and the deeper areas of peat where reasonably practicable. The worst-case volume of excavated peat is estimated to be 28,900m^3.

7.1.3 Due to the limited extent of above ground infrastructure included within the Proposed Development there are limited opportunities for onsite re-use. These limited on-site peat re-use opportunities have been identified based on best practice and include restoration of disturbed development margins and restoration of heathland in the proximity of the proposed compound area in the east of the site. It is anticipated that a minority of excavated peat will be reused within the Development Area in this way.

7.1.4 Based on the information currently available, worst-case estimates of peat extraction and re-use volumes have been calculated. A volume of circa 28,900m^3 is currently calculated as a worst-case excess. Following completion of the detailed design including laboratory testing and groundwater monitoring results, post consent, the peat balance will be re-calculated, and the volume of excavated peat is expected to be significantly less than currently calculated when the detailed site design work is undertaken.

7.1.5 The Applicant will work with the Argyll and Bute Council and local landowners to identify suitable re-use receptors for the excess peat in the local area.

7.1.6 Where further re-use options prove not practicable then the ultimate option will be disposal of suitable peat. It is recognised that this disposal option is the worst-case option but that it has been considered by the developer and included in the cost plan for the development.

7.1.7 The principles of a peat handling method statement have been set out above.

8 References

BGS (1992) Geological Survey of Scotland 1:50,000 Series, Sheet 45E (Scotland) Dalmally, Solid Geology, Keyworth. Nottingham, British Geological Survey.

BGS (2022) GeoIndex Onshore online interactive viewer, available at: http://mapapps2.bgs.ac.uk/geoindex/home.html, accessed: 14/06/2022.

Groundsure Ltd (2022) Groundsure Reports for Cruachan East (GSIP-2022-12632-9901) and Cruachan West (GSIP-2022-12632-9903).

Stantec (2020) Design Basis Report Cruachan 2.0: Concept Design Stage, report reference: RPT_41525551_01_Design Basis Report.

Developments on Peatland: Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste, SEPA, 2012

Developments on Peat and Off-Site Uses of Waste Peat, WST-G-052, SEPA, 2017 Peat Landslide Hazard and Risk Assessments: Best Practice Guide, Scottish Government, 2017

Guidance on Developments on Peatland: Peatland Survey (online version only), Scottish Government, SNH, SEPA, 2017. https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2018/12/peatland-survey-guidance/documents/peatland-survey-guidance-2017/peatland-survey-guidance-2017/govscot%3Adocument, accessed: 14/06/2022

Marsden K. and Ebmeier S. (2012) 'Peatlands and Climate Change'. SPICe Briefing. 20 April 2012.

SKF (2022). Peat Probing Survey.

Stantec (2022). Cruachan Expansion Project – Preliminary Investigation Report on Ground Conditions (Contamination and Stability).

Stantec (2022) Cruachan Expansion Project. EIA Report Volume 1 – Main Report

Figures

Stantec	Client Drax Generation Enterprise Ltd	**CRUACHAN EXPANSION PROJECT** Peat Probing Location Plan	0 0.5 1 km © Crown copyright and database rights [2022] Ordnance Survey 0100031673	1:17,500 @ A3	Date: 29/06/2022
				Drawn: JP	Checked: AM
				Figure 01	Rev A

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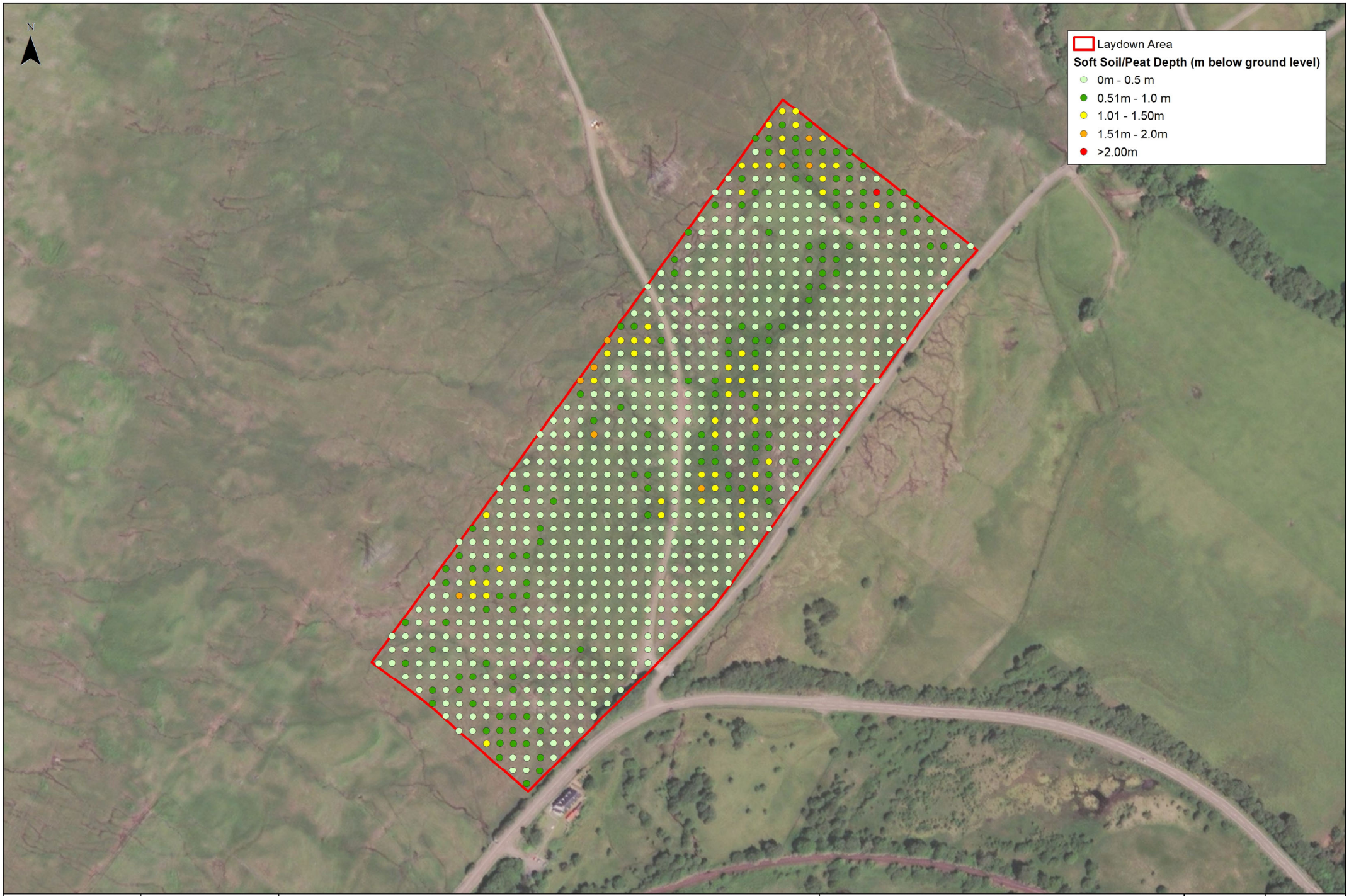

Stantec

Client: Drax Hydro Ltd.

CRUACHAN EXPANSION PROJECT

Peat Depth Plan

0 100 200 m

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Figure 10.2	Rev A

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Appendix A Peat Survey Data

6762 CRUACHAN 2 LAYDOWN AREA - PEAT PROBING

PROBE LOCATION	EASTING	NORTHING	LEVEL (mAOD)	SOFT SOIL / PEAT DEPTH (m BGL)
1	213138.86	728303.43	50.07	0.60
2	213128.70	728313.39	52.76	0.05
3	213138.72	728313.37	51.62	0.30
4	213148.71	728312.95	49.97	0.55
5	213118.89	728322.95	53.67	0.80
6	213128.81	728322.93	53.49	0.25
7	213139.22	728322.65	52.98	0.10
8	213149.20	728322.81	50.65	0.90
9	213159.10	728322.78	49.90	0.35
10	213109.21	728333.12	54.71	1.05
11	213119.20	728333.15	54.14	0.90
12	213129.13	728332.91	53.76	0.95
13	213138.79	728332.78	53.15	0.75
14	213148.81	728333.12	51.76	0.40
15	213159.12	728333.27	50.28	0.30
16	213168.98	728333.08	49.89	0.15
17	213088.85	728342.85	56.32	0.20
18	213098.81	728342.84	55.71	0.45
19	213109.07	728342.83	55.20	0.70
20	213119.03	728342.96	54.45	0.80
21	213128.82	728342.96	54.05	1.00
22	213138.88	728342.90	53.93	0.10
23	213149.22	728342.73	52.43	0.85
24	213159.08	728343.06	50.05	0.45
25	213169.23	728343.00	49.54	0.30
26	213179.21	728343.20	48.54	0.15
27	213079.10	728353.24	58.01	0.10
28	213088.93	728353.05	56.94	0.40
29	213099.20	728352.87	56.34	0.30
30	213109.08	728353.09	55.38	0.25
31	213119.06	728353.10	54.64	0.60
32	213129.01	728353.01	54.30	0.55
33	213139.18	728353.01	53.96	0.90
34	213148.89	728352.89	53.97	0.20
35	213159.06	728352.95	51.33	0.50
36	213169.03	728352.81	50.06	0.40
37	213179.08	728352.81	48.82	0.10
38	213188.88	728353.00	48.51	0.20
39	213069.01	728363.04	60.15	0.55
40	213078.99	728363.06	58.50	0.35
41	213089.04	728362.94	57.44	0.25
42	213099.08	728362.94	56.76	0.55
43	213108.98	728362.94	55.47	0.20
44	213119.03	728362.88	55.09	0.10
45	213129.09	728363.10	54.75	0.20
46	213138.86	728362.94	54.27	0.15
47	213148.99	728363.00	53.81	0.10
48	213159.04	728362.99	52.63	0.15

PROBE LOCATION	EASTING	NORTHING	LEVEL (mAOD)	SOFT SOIL / PEAT DEPTH (m BGL)
49	213169.12	728363.03	50.25	0.35
50	213179.05	728363.04	49.48	0.20
51	213189.07	728362.86	49.21	0.10
52	213198.97	728363.01	48.95	0.15
53	213059.02	728372.98	63.60	0.25
54	213069.10	728372.88	61.16	0.65
55	213079.01	728373.06	58.86	0.10
56	213089.02	728372.97	57.60	0.55
57	213099.04	728372.95	57.01	0.45
58	213109.10	728372.97	55.98	0.20
59	213119.06	728372.96	55.49	0.20
60	213129.00	728373.02	54.80	0.65
61	213139.08	728372.98	54.38	0.50
62	213149.01	728372.97	53.40	0.45
63	213159.07	728372.98	53.26	0.05
64	213169.13	728372.97	51.12	0.30
65	213179.04	728373.04	50.37	0.05
66	213188.94	728372.79	49.79	0.10
67	213199.09	728373.04	49.82	0.05
68	213209.05	728372.98	49.72	0.15
69	213049.05	728382.99	65.96	0.15
70	213059.02	728382.99	64.88	0.10
71	213069.05	728382.93	62.73	0.05
72	213079.03	728382.83	60.16	0.20
73	213088.88	728382.92	58.17	0.70
74	213099.05	728383.04	57.52	0.80
75	213109.03	728382.99	56.76	0.45
76	213118.99	728383.01	55.78	0.05
77	213129.01	728383.03	54.77	1.00
78	213138.92	728383.08	54.08	0.15
79	213149.03	728383.01	53.34	0.05
80	213159.07	728382.90	52.06	0.35
81	213169.06	728383.00	50.92	0.30
82	213178.96	728383.16	50.81	0.05
83	213189.07	728382.99	50.83	0.10
84	213198.71	728382.93	51.11	0.05
85	213208.97	728382.85	50.77	0.05
86	213218.97	728382.99	50.23	0.00
87	213029.02	728392.98	67.81	0.50
88	213039.05	728393.10	66.84	0.10
89	213048.97	728392.95	65.10	0.75
90	213059.04	728392.91	66.53	0.25
91	213069.08	728393.00	63.56	0.50
92	213079.01	728392.98	61.93	0.15
93	213088.97	728393.04	59.07	0.15
94	213099.03	728392.99	57.95	0.45
95	213109.04	728392.99	57.08	0.60
96	213119.03	728392.93	56.32	0.20

PROBE LOCATION	EASTING	NORTHING	LEVEL (mAOD)	SOFT SOIL / PEAT DEPTH (m BGL)
97	213128.99	728393.06	54.85	0.10
98	213139.02	728392.96	54.04	0.15
99	213149.03	728393.01	53.32	0.25
100	213159.05	728392.97	52.39	0.05
101	213168.98	728393.01	51.61	0.05
102	213179.04	728392.92	51.11	0.25
103	213189.08	728393.00	51.44	0.25
104	213199.04	728393.00	51.32	0.25
105	213209.06	728393.00	51.13	0.15
106	213219.00	728392.97	50.75	0.05
107	213229.05	728393.04	50.09	0.00
108	213039.08	728402.96	65.84	0.05
109	213049.09	728403.08	64.46	0.10
110	213059.02	728402.85	63.49	0.40
111	213068.98	728402.98	62.52	0.80
112	213078.90	728403.04	61.43	0.15
113	213088.98	728403.00	59.48	0.20
114	213099.13	728402.92	58.73	0.15
115	213109.11	728402.84	57.97	0.40
116	213118.80	728402.93	56.82	0.10
117	213128.94	728402.86	55.82	0.20
118	213139.30	728403.33	55.08	0.25
119	213148.89	728402.83	53.88	0.15
120	213159.01	728403.05	54.38	0.10
121	213168.95	728403.09	53.16	0.10
122	213179.00	728403.01	51.73	0.70
123	213188.99	728403.01	51.52	0.40
124	213199.02	728402.98	51.83	0.20
125	213208.99	728402.98	51.66	0.05
126	213218.99	728402.99	51.45	0.05
127	213229.01	728403.05	50.70	0.00
128	213239.05	728403.02	50.17	0.20
129	213039.02	728413.06	65.79	0.35
130	213049.02	728413.00	64.30	0.35
131	213059.09	728412.92	63.20	0.20
132	213068.96	728413.06	62.30	0.25
133	213079.00	728412.91	60.73	0.00
134	213089.01	728413.02	60.10	0.10
135	213098.98	728413.07	59.41	0.25
136	213109.00	728413.04	58.49	0.40
137	213119.03	728413.09	57.59	0.50
138	213128.96	728412.93	56.90	0.45
139	213139.11	728413.12	55.44	0.40
140	213148.99	728413.04	54.95	0.25
141	213158.99	728413.00	54.83	0.05
142	213169.02	728413.04	54.12	0.10
143	213179.00	728412.97	53.15	0.05
144	213189.03	728413.01	52.55	0.15

PROBE LOCATION	EASTING	NORTHING	LEVEL (mAOD)	SOFT SOIL / PEAT DEPTH (m BGL)
145	213199.03	728413.00	52.40	0.05
146	213209.04	728413.03	51.93	0.10
147	213218.96	728413.02	51.84	0.10
148	213228.99	728412.95	51.43	0.00
149	213238.96	728412.97	51.04	0.05
150	213249.01	728413.01	50.39	0.15
151	213048.95	728422.98	65.22	0.60
152	213058.97	728423.06	64.05	0.15
153	213069.01	728422.97	62.18	0.30
154	213078.98	728423.02	61.33	0.60
155	213088.95	728422.94	60.21	0.25
156	213098.94	728422.94	59.30	0.35
157	213108.95	728422.97	58.60	0.50
158	213118.95	728422.99	57.65	0.20
159	213129.05	728423.07	56.41	0.25
160	213139.14	728423.03	56.13	0.50
161	213148.96	728423.05	55.89	0.10
162	213159.05	728422.98	54.84	0.30
163	213169.07	728423.06	54.74	0.10
164	213179.03	728423.07	54.54	0.05
165	213189.02	728423.01	53.47	0.10
166	213199.07	728422.95	53.31	0.05
167	213209.00	728422.98	52.65	0.05
168	213218.98	728422.96	52.29	0.10
169	213229.00	728422.99	51.87	0.00
170	213238.97	728423.03	51.59	0.05
171	213248.95	728422.99	51.29	0.05
172	213259.09	728422.89	50.30	0.15
173	213058.97	728433.02	64.58	0.20
174	213068.98	728432.99	63.34	0.10
175	213079.03	728433.01	61.49	0.20
176	213088.98	728433.05	60.56	0.20
177	213098.93	728433.04	59.52	0.30
178	213108.97	728432.95	58.71	0.55
179	213119.04	728432.98	57.47	0.30
180	213129.03	728432.95	57.33	0.60
181	213138.97	728432.97	56.58	0.25
182	213148.99	728432.97	57.01	0.10
183	213159.04	728432.92	56.14	0.25
184	213168.94	728433.05	55.70	0.10
185	213179.00	728432.92	55.89	0.10
186	213188.99	728433.03	54.66	0.05
187	213199.04	728432.99	54.12	0.05
188	213208.97	728432.96	53.63	0.05
189	213219.02	728433.00	53.22	0.05
190	213228.96	728433.03	52.50	0.05
191	213238.99	728433.04	52.14	0.05
192	213248.99	728433.00	51.85	0.00

PROBE LOCATION	EASTING	NORTHING	LEVEL (mAOD)	SOFT SOIL / PEAT DEPTH (m BGL)
193	213259.00	728432.97	51.39	0.05
194	213269.02	728433.02	50.63	0.10
195	213068.92	728442.90	64.13	0.10
196	213079.05	728443.03	62.90	0.25
197	213089.02	728443.04	60.95	1.70
198	213099.05	728442.92	60.34	1.50
199	213109.02	728442.98	59.32	1.40
200	213119.00	728442.92	58.30	0.95
201	213129.03	728442.97	57.72	0.75
202	213139.05	728442.98	57.23	0.80
203	213149.00	728442.98	57.16	0.25
204	213158.96	728443.00	56.93	0.50
205	213169.01	728443.02	56.94	0.10
206	213179.02	728442.97	56.58	0.10
207	213189.10	728442.96	55.89	0.05
208	213199.01	728443.02	54.86	0.05
209	213209.02	728443.04	54.34	0.05
210	213219.09	728443.08	53.83	0.05
211	213229.01	728442.97	52.92	0.05
212	213238.98	728443.00	52.74	0.05
213	213248.99	728443.01	52.16	0.00
214	213259.05	728443.01	51.86	0.05
215	213269.04	728443.00	51.01	0.10
216	213279.01	728443.00	50.31	0.10
217	213069.04	728453.01	64.10	0.35
218	213079.09	728453.08	62.63	0.80
219	213088.99	728453.04	61.68	0.20
220	213099.02	728453.06	60.65	1.30
221	213109.05	728453.03	59.43	1.20
222	213118.89	728453.10	59.15	0.40
223	213129.01	728452.99	58.51	0.40
224	213139.00	728453.01	57.98	1.00
225	213149.00	728452.97	57.63	0.20
226	213158.98	728452.98	57.21	0.50
227	213169.02	728452.98	57.02	0.25
228	213179.02	728452.98	56.87	0.10
229	213189.00	728453.00	56.28	0.05
230	213199.05	728452.98	55.42	0.05
231	213208.99	728452.99	54.91	0.05
232	213218.99	728453.01	54.40	0.05
233	213229.06	728452.98	53.82	0.05
234	213238.99	728453.01	53.36	0.00
235	213248.98	728453.03	52.24	0.05
236	213259.03	728453.02	52.14	0.05
237	213269.02	728452.99	51.72	0.05
238	213279.04	728453.01	50.86	0.05
239	213288.99	728453.02	50.44	0.05
240	213079.02	728462.99	63.29	0.55

PROBE LOCATION	EASTING	NORTHING	LEVEL (mAOD)	SOFT SOIL / PEAT DEPTH (m BGL)
241	213088.95	728463.00	62.89	0.10
242	213099.01	728462.98	61.72	0.70
243	213108.99	728463.04	60.61	0.70
244	213119.00	728463.02	59.66	1.35
245	213128.98	728463.01	59.49	0.30
246	213139.05	728462.99	58.38	0.15
247	213148.89	728462.94	58.37	0.05
248	213158.98	728462.96	58.00	0.05
249	213168.99	728462.94	57.24	0.10
250	213178.98	728463.04	56.87	0.10
251	213188.98	728463.01	56.36	0.05
252	213198.99	728462.99	55.88	0.05
253	213209.02	728463.08	55.13	0.10
254	213219.02	728463.03	54.89	0.05
255	213229.01	728462.99	54.48	0.05
256	213238.97	728463.01	53.67	0.00
257	213249.00	728462.99	53.00	0.05
258	213259.00	728463.01	52.32	0.05
259	213268.97	728463.10	51.78	0.05
260	213279.04	728462.98	51.09	0.05
261	213289.02	728462.98	51.04	0.05
262	213089.04	728472.98	63.48	0.80
263	213098.96	728472.91	62.73	0.10
264	213108.98	728472.99	62.03	0.20
265	213118.97	728472.98	60.66	0.10
266	213128.97	728473.01	59.61	0.90
267	213139.02	728472.96	59.03	0.75
268	213149.02	728472.95	58.75	0.05
269	213159.01	728473.00	58.54	0.10
270	213168.88	728472.94	58.10	0.05
271	213179.03	728472.97	57.42	0.10
272	213188.99	728472.99	56.89	0.05
273	213199.03	728472.99	56.38	0.05
274	213209.06	728473.03	55.45	0.45
275	213219.00	728472.96	54.99	0.10
276	213229.05	728472.98	54.88	0.05
277	213239.07	728473.09	54.16	0.05
278	213248.90	728473.11	53.22	0.05
279	213259.00	728472.98	52.40	0.10
280	213268.98	728472.97	51.86	0.10
281	213279.06	728473.03	51.21	0.10
282	213289.06	728472.94	51.10	0.05
283	213299.03	728472.98	50.80	0.05
284	213089.03	728483.02	64.97	0.30
285	213098.99	728482.99	63.48	0.40
286	213108.97	728482.98	63.76	0.15
287	213119.02	728483.00	61.67	0.10
288	213128.99	728483.00	60.68	0.10

PROBE LOCATION	EASTING	NORTHING	LEVEL (mAOD)	SOFT SOIL / PEAT DEPTH (m BGL)
289	213139.01	728483.02	59.97	0.25
290	213148.99	728483.03	58.99	1.00
291	213158.96	728483.02	59.29	0.10
292	213169.01	728482.90	59.00	0.05
293	213179.00	728483.06	58.38	0.05
294	213188.98	728483.01	57.57	0.05
295	213199.03	728482.92	56.97	0.05
296	213208.99	728483.11	55.85	0.15
297	213219.05	728483.00	55.20	0.25
298	213229.05	728482.92	55.06	0.10
299	213238.97	728482.99	54.73	0.05
300	213249.04	728483.05	53.82	0.10
301	213259.04	728482.91	52.82	0.15
302	213268.95	728483.02	52.41	0.10
303	213279.03	728483.01	51.51	0.10
304	213288.97	728482.89	51.27	0.05
305	213298.86	728482.86	50.40	0.10
306	213308.96	728482.99	50.99	0.05
307	213098.99	728492.81	64.37	0.95
308	213109.05	728492.81	63.78	0.20
309	213119.09	728493.00	63.20	0.15
310	213129.10	728493.09	61.35	0.20
311	213138.98	728492.99	60.40	0.20
312	213149.01	728493.02	59.48	0.65
313	213158.96	728492.93	59.39	0.05
314	213169.16	728493.05	59.29	0.05
315	213178.99	728493.04	58.77	0.10
316	213188.92	728493.00	58.20	0.10
317	213199.10	728493.11	57.26	0.10
318	213209.04	728492.96	56.36	0.10
319	213219.05	728492.98	55.16	0.25
320	213228.93	728492.96	55.22	0.10
321	213238.94	728492.99	54.98	0.05
322	213248.98	728493.05	54.31	0.00
323	213259.06	728492.89	53.22	0.05
324	213269.03	728493.05	52.40	0.10
325	213279.07	728492.88	51.84	0.05
326	213289.08	728492.97	51.17	0.10
327	213298.97	728492.96	50.30	1.50
328	213308.97	728492.98	50.81	0.10
329	213318.98	728492.93	51.02	0.15
330	213108.99	728503.02	64.36	1.20
331	213119.02	728502.97	63.11	0.10
332	213128.96	728502.98	61.69	0.15
333	213139.02	728503.01	60.75	0.50
334	213148.98	728503.06	60.12	0.10
335	213158.97	728502.98	59.91	0.10
336	213169.03	728503.00	59.52	0.10

PROBE LOCATION	EASTING	NORTHING	LEVEL (mAOD)	SOFT SOIL / PEAT DEPTH (m BGL)
337	213178.95	728503.03	58.77	0.05
338	213189.04	728503.03	57.72	0.20
339	213198.97	728503.01	57.09	0.10
340	213209.02	728503.01	56.68	0.10
341	213218.99	728502.94	55.90	0.05
342	213228.99	728503.02	54.86	0.85
343	213238.98	728503.05	54.63	1.10
344	213248.99	728502.99	54.54	0.00
345	213259.00	728503.03	53.63	0.05
346	213268.97	728502.96	52.29	0.10
347	213278.99	728502.95	52.08	0.10
348	213289.02	728502.96	51.12	0.05
349	213298.98	728503.02	50.40	1.45
350	213308.99	728502.96	50.72	0.05
351	213318.96	728502.95	52.04	0.05
352	213119.00	728512.98	63.26	0.35
353	213129.03	728512.96	62.08	0.50
354	213139.03	728512.96	61.38	0.15
355	213149.05	728513.02	60.46	0.35
356	213158.98	728512.99	59.79	0.75
357	213168.98	728513.02	59.58	0.15
358	213179.00	728512.99	59.40	0.05
359	213189.02	728512.95	58.45	0.05
360	213199.04	728512.97	57.81	0.10
361	213208.98	728512.98	57.09	0.35
362	213219.04	728512.97	56.70	0.10
363	213229.02	728512.98	55.24	0.50
364	213239.01	728512.95	54.68	1.10
365	213248.99	728513.04	54.78	0.00
366	213259.02	728512.92	53.30	0.40
367	213269.08	728513.00	51.61	1.20
368	213279.06	728513.02	51.24	0.10
369	213289.02	728512.97	50.53	0.35
370	213298.96	728513.00	50.63	1.25
371	213309.01	728513.04	51.48	0.15
372	213319.00	728512.95	51.53	0.80
373	213329.00	728512.97	53.16	0.10
374	213119.02	728522.99	62.87	0.25
375	213128.98	728523.03	62.47	0.50
376	213138.99	728522.97	61.54	0.75
377	213148.98	728522.96	60.82	0.30
378	213159.05	728523.03	60.31	0.10
379	213169.02	728523.01	59.87	0.20
380	213178.98	728523.02	59.57	0.10
381	213189.00	728523.01	59.00	0.05
382	213199.01	728523.00	58.22	0.05
383	213209.07	728522.95	56.98	0.25
384	213218.99	728523.00	56.40	0.35

PROBE LOCATION	EASTING	NORTHING	LEVEL (mAOD)	SOFT SOIL / PEAT DEPTH (m BGL)
385	213229.04	728523.00	55.64	0.60
386	213239.02	728522.93	55.20	0.50
387	213249.03	728523.03	54.95	0.00
388	213258.96	728523.01	53.47	0.50
389	213268.99	728522.94	51.87	1.75
390	213279.02	728523.02	50.91	1.15
391	213289.01	728522.99	50.47	0.85
392	213298.99	728522.99	51.19	0.60
393	213308.98	728522.98	51.61	1.20
394	213318.97	728523.00	51.74	0.60
395	213329.02	728522.99	53.30	0.05
396	213339.00	728523.01	54.54	0.05
397	213129.00	728532.99	62.70	0.15
398	213138.98	728533.03	62.32	0.25
399	213148.99	728532.98	61.74	0.20
400	213158.97	728532.96	60.51	0.05
401	213169.03	728532.94	60.18	0.05
402	213178.99	728532.97	59.88	0.10
403	213189.00	728532.92	59.14	0.05
404	213199.01	728533.03	58.58	0.05
405	213209.01	728533.01	57.46	0.05
406	213219.05	728533.03	56.76	0.95
407	213229.08	728532.88	55.71	0.60
408	213239.04	728533.04	55.46	0.40
409	213249.06	728532.98	55.39	0.05
410	213259.02	728533.09	53.79	0.35
411	213269.03	728532.97	51.73	1.20
412	213279.02	728533.02	50.96	1.20
413	213288.97	728532.88	50.74	0.65
414	213299.00	728532.94	51.54	0.50
415	213309.09	728533.08	51.67	1.05
416	213319.02	728532.96	52.28	0.80
417	213329.05	728532.91	55.34	0.05
418	213338.91	728533.12	55.45	0.10
419	213139.02	728543.00	62.25	0.20
420	213149.01	728543.01	61.04	0.30
421	213158.98	728542.96	60.75	0.10
422	213168.96	728542.99	60.55	0.05
423	213179.01	728542.97	60.43	0.10
424	213188.99	728542.97	59.83	0.10
425	213199.05	728543.00	59.14	0.05
426	213208.97	728543.02	57.86	0.30
427	213219.02	728542.98	57.66	0.05
428	213229.01	728543.04	57.28	0.05
429	213239.03	728542.97	56.56	0.05
430	213248.94	728543.01	55.74	0.05
431	213258.99	728542.99	54.10	0.25
432	213268.98	728542.99	51.47	0.75

PROBE LOCATION	EASTING	NORTHING	LEVEL (mAOD)	SOFT SOIL / PEAT DEPTH (m BGL)
433	213279.02	728543.06	51.05	1.00
434	213289.01	728543.01	51.19	0.20
435	213299.01	728542.98	51.82	0.30
436	213309.05	728543.03	52.08	0.80
437	213318.96	728542.97	52.94	1.10
438	213329.01	728543.00	56.90	0.05
439	213339.03	728543.00	55.76	0.70
440	213349.00	728542.98	55.59	0.10
441	213149.05	728553.04	61.21	0.20
442	213158.99	728552.92	60.72	0.15
443	213169.05	728552.99	60.67	0.25
444	213178.98	728552.95	60.50	0.20
445	213188.96	728552.97	59.91	0.10
446	213199.01	728552.98	59.41	0.05
447	213209.01	728552.99	58.61	0.30
448	213219.01	728552.99	58.41	0.05
449	213229.02	728553.02	57.74	0.05
450	213239.02	728552.98	56.52	0.10
451	213249.00	728552.96	56.35	0.00
452	213259.02	728552.99	54.54	0.05
453	213269.03	728552.99	51.73	0.50
454	213278.99	728553.04	51.33	1.00
455	213289.00	728552.97	51.57	0.35
456	213299.02	728553.03	51.95	0.45
457	213309.01	728553.01	52.38	1.00
458	213319.00	728553.04	53.22	0.70
459	213329.03	728552.99	56.12	0.05
460	213338.93	728552.97	56.71	0.10
461	213349.03	728552.97	56.33	0.50
462	213358.98	728553.03	57.02	0.10
463	213149.02	728563.02	61.73	0.05
464	213158.95	728563.01	60.67	0.30
465	213169.01	728563.01	60.88	0.05
466	213178.98	728563.00	60.33	0.20
467	213188.99	728563.04	59.84	1.95
468	213199.01	728563.01	59.10	0.25
469	213209.04	728563.01	59.15	0.05
470	213219.01	728563.02	58.47	0.10
471	213229.01	728563.02	57.38	0.65
472	213238.96	728563.00	56.68	0.20
473	213249.01	728562.92	56.76	0.00
474	213259.03	728563.01	54.88	0.05
475	213269.00	728562.96	51.71	0.55
476	213279.00	728563.00	51.33	1.10
477	213288.99	728563.02	51.72	0.25
478	213299.04	728562.98	52.22	0.50
479	213309.01	728563.03	52.43	0.70
480	213319.00	728563.00	53.64	0.90

PROBE LOCATION	EASTING	NORTHING	LEVEL (mAOD)	SOFT SOIL / PEAT DEPTH (m BGL)
481	213329.01	728563.03	55.84	0.05
482	213339.05	728562.98	56.74	0.05
483	213349.05	728563.04	56.70	0.40
484	213358.98	728563.02	56.81	0.35
485	213369.00	728563.01	56.50	0.10
486	213159.07	728572.98	62.44	0.10
487	213169.00	728573.01	61.89	0.10
488	213179.01	728573.01	60.73	0.05
489	213188.98	728573.02	60.01	1.00
490	213198.96	728573.00	59.54	0.10
491	213209.00	728572.94	59.17	0.05
492	213219.04	728573.02	58.04	0.40
493	213228.97	728573.02	57.61	0.50
494	213238.99	728572.96	58.46	0.05
495	213249.02	728573.03	57.22	0.10
496	213259.03	728573.03	57.03	0.00
497	213268.98	728572.95	52.78	0.10
498	213278.99	728572.97	51.72	1.20
499	213289.08	728573.01	51.90	0.15
500	213299.02	728573.00	52.18	0.45
501	213308.96	728572.99	52.66	1.25
502	213318.91	728573.09	54.90	0.05
503	213329.06	728573.03	55.09	0.10
504	213339.05	728572.99	55.89	0.05
505	213349.00	728572.98	56.96	0.05
506	213358.98	728572.96	56.92	0.05
507	213369.02	728572.99	57.02	0.05
508	213169.01	728582.98	62.25	0.10
509	213179.05	728582.99	61.32	0.10
510	213189.03	728583.02	60.10	0.10
511	213199.01	728582.97	59.57	0.10
512	213209.01	728582.98	59.15	0.60
513	213219.03	728583.01	58.34	0.10
514	213228.99	728583.01	59.06	0.10
515	213239.01	728583.01	58.64	0.10
516	213249.00	728583.04	57.44	0.00
517	213258.99	728582.93	57.09	0.00
518	213268.98	728583.01	53.76	0.10
519	213278.98	728583.02	52.25	0.15
520	213288.99	728583.01	51.90	0.35
521	213298.99	728582.97	52.25	0.20
522	213309.01	728582.99	52.73	1.00
523	213319.03	728583.04	55.12	0.10
524	213329.06	728582.99	56.31	0.05
525	213339.00	728583.02	55.31	0.05
526	213348.97	728582.98	56.37	0.05
527	213359.00	728583.00	57.17	0.05
528	213369.02	728582.98	57.38	0.15

PROBE LOCATION	EASTING	NORTHING	LEVEL (mAOD)	SOFT SOIL / PEAT DEPTH (m BGL)
529	213379.00	728583.05	56.55	0.10
530	213178.99	728592.95	60.62	0.60
531	213189.02	728592.96	60.06	0.25
532	213199.04	728592.97	59.55	0.10
533	213209.00	728593.00	58.81	0.30
534	213219.03	728593.05	59.41	0.05
535	213228.99	728593.04	58.93	0.05
536	213239.05	728592.98	58.26	0.05
537	213249.02	728592.99	57.57	0.00
538	213259.00	728592.98	57.08	0.05
539	213268.99	728593.01	53.76	0.20
540	213279.01	728592.96	52.81	1.00
541	213289.02	728593.02	51.86	1.20
542	213299.05	728593.00	52.47	0.70
543	213309.03	728592.97	52.81	1.15
544	213319.01	728592.99	54.81	0.05
545	213328.97	728592.98	55.48	0.10
546	213339.03	728593.00	57.57	0.05
547	213348.98	728593.01	55.87	0.10
548	213359.00	728592.95	56.47	0.05
549	213369.01	728592.99	57.45	0.10
550	213378.97	728592.97	57.38	0.05
551	213388.99	728593.00	56.52	0.05
552	213179.02	728602.99	60.61	1.55
553	213189.03	728602.98	60.22	1.20
554	213198.99	728602.94	60.40	0.05
555	213209.05	728603.02	60.05	0.05
556	213219.02	728602.99	60.30	0.00
557	213229.03	728603.03	58.74	0.10
558	213239.02	728602.98	58.29	0.05
559	213249.05	728602.97	57.06	0.15
560	213259.05	728602.96	55.36	0.70
561	213269.03	728603.02	54.79	0.40
562	213279.00	728603.00	53.23	0.65
563	213288.98	728603.01	52.47	1.45
564	213299.02	728602.97	52.39	1.35
565	213309.01	728602.94	54.08	0.05
566	213319.03	728603.02	54.66	0.10
567	213328.99	728603.00	54.85	0.10
568	213339.00	728603.02	55.55	0.05
569	213349.01	728603.07	55.73	0.10
570	213359.01	728603.05	56.42	0.00
571	213368.95	728603.05	56.47	0.00
572	213378.98	728603.02	57.09	0.00
573	213389.05	728602.95	56.52	0.00
574	213399.00	728603.00	56.01	0.05
575	213189.02	728612.96	60.20	1.95
576	213199.00	728612.98	59.61	0.50

PROBE LOCATION	EASTING	NORTHING	LEVEL (mAOD)	SOFT SOIL / PEAT DEPTH (m BGL)
577	213209.01	728613.01	60.33	0.00
578	213219.01	728613.00	59.60	0.20
579	213229.03	728612.99	58.76	0.10
580	213238.94	728612.95	57.29	0.50
581	213249.00	728612.99	57.71	0.00
582	213258.99	728613.01	57.41	0.40
583	213268.97	728612.96	55.89	0.20
584	213279.00	728613.03	54.76	0.15
585	213288.97	728613.00	52.91	1.10
586	213299.02	728612.95	52.67	0.10
587	213309.04	728612.96	52.55	1.50
588	213318.98	728612.99	54.49	0.05
589	213329.01	728613.06	55.00	0.05
590	213339.03	728612.97	55.27	0.05
591	213348.89	728613.06	55.74	0.05
592	213359.04	728612.97	55.82	0.05
593	213368.99	728612.99	56.32	0.05
594	213378.95	728613.01	56.67	0.00
595	213389.02	728612.98	56.58	0.00
596	213399.05	728612.99	56.32	0.00
597	213198.99	728623.02	59.44	1.10
598	213209.00	728623.09	59.30	0.25
599	213219.02	728623.04	58.96	1.40
600	213229.02	728622.96	58.32	0.25
601	213238.98	728622.98	58.03	0.40
602	213249.01	728623.01	58.13	0.00
603	213258.99	728622.97	57.58	0.15
604	213269.01	728622.99	56.13	0.40
605	213279.03	728623.00	55.13	0.10
606	213289.00	728622.98	53.26	0.90
607	213298.99	728622.97	53.00	1.20
608	213308.99	728622.99	52.55	1.00
609	213319.02	728622.99	53.80	0.10
610	213328.99	728623.00	55.16	0.10
611	213339.01	728622.98	55.59	0.05
612	213349.02	728623.00	55.66	0.05
613	213359.00	728623.02	56.32	0.05
614	213369.02	728623.01	56.21	0.05
615	213378.97	728622.99	56.40	0.05
616	213388.97	728622.98	56.50	0.00
617	213398.94	728623.03	56.38	0.05
618	213409.05	728623.00	56.29	0.10
619	213199.02	728632.97	58.15	2.00
620	213208.97	728632.98	59.13	1.50
621	213218.99	728633.04	58.66	1.25
622	213228.95	728632.97	58.35	1.10
623	213239.00	728633.03	58.00	0.75
624	213249.02	728632.95	58.43	0.05

PROBE LOCATION	EASTING	NORTHING	LEVEL (mAOD)	SOFT SOIL / PEAT DEPTH (m BGL)
625	213259.00	728632.97	57.53	0.20
626	213269.01	728632.95	56.39	0.10
627	213279.05	728632.99	55.61	0.40
628	213289.02	728633.03	53.64	0.80
629	213299.00	728632.94	53.39	0.30
630	213309.07	728633.02	52.81	0.60
631	213319.02	728633.01	53.02	0.70
632	213329.02	728633.02	54.53	0.05
633	213339.01	728633.05	55.49	0.05
634	213349.01	728632.98	55.66	0.05
635	213359.00	728633.00	56.20	0.05
636	213369.03	728632.94	56.14	0.05
637	213379.01	728632.99	56.30	0.05
638	213389.04	728633.04	56.33	0.05
639	213398.97	728632.96	56.42	0.05
640	213409.02	728632.99	56.41	0.10
641	213418.97	728632.96	56.34	0.10
642	213209.04	728643.02	57.84	1.00
643	213219.03	728643.01	57.55	1.00
644	213229.06	728642.96	57.27	1.30
645	213238.97	728643.01	57.23	0.10
646	213249.00	728643.01	57.10	0.15
647	213259.04	728642.98	56.19	0.20
648	213268.97	728642.94	56.42	0.20
649	213279.05	728642.99	56.26	0.30
650	213289.00	728643.01	54.10	0.50
651	213299.02	728643.03	54.05	0.75
652	213308.96	728642.97	53.67	0.10
653	213319.03	728642.96	53.09	0.60
654	213329.03	728642.98	53.29	0.85
655	213338.99	728642.99	53.77	0.20
656	213349.01	728643.03	55.42	0.05
657	213359.03	728642.97	55.53	0.05
658	213369.02	728643.00	55.82	0.05
659	213379.05	728643.04	56.11	0.05
660	213388.98	728643.04	56.14	0.05
661	213398.97	728642.99	56.22	0.05
662	213409.04	728642.94	56.34	0.10
663	213418.99	728642.98	56.39	0.05
664	213218.98	728653.02	59.17	0.10
665	213228.98	728652.94	58.70	0.20
666	213238.99	728653.03	59.05	0.00
667	213249.04	728653.01	58.06	0.15
668	213258.98	728653.01	57.02	0.05
669	213269.01	728652.98	55.32	0.00
670	213278.98	728653.03	55.77	0.05
671	213289.05	728653.01	56.07	0.05
672	213299.02	728652.98	55.64	0.10

PROBE LOCATION	EASTING	NORTHING	LEVEL (mAOD)	SOFT SOIL / PEAT DEPTH (m BGL)
673	213309.03	728652.99	55.59	0.05
674	213319.02	728652.99	55.61	0.10
675	213329.01	728652.95	53.68	0.50
676	213338.99	728652.97	53.28	0.40
677	213349.01	728653.00	53.50	0.50
678	213358.98	728653.04	54.82	0.05
679	213369.00	728652.98	55.26	0.05
680	213379.04	728653.02	55.63	0.05
681	213389.05	728652.97	55.83	0.05
682	213398.99	728652.98	55.90	0.05
683	213408.98	728652.99	56.06	0.05
684	213419.00	728652.98	56.29	0.05
685	213429.03	728653.00	56.01	0.05
686	213228.97	728663.03	58.99	0.10
687	213238.95	728662.97	58.53	0.05
688	213248.99	728663.00	57.68	0.20
689	213259.03	728663.01	56.40	0.40
690	213269.05	728663.04	56.74	0.50
691	213278.96	728662.97	56.32	0.10
692	213288.97	728662.94	56.15	0.05
693	213299.02	728662.96	55.77	0.10
694	213309.02	728663.03	55.86	0.05
695	213319.06	728662.98	55.83	0.10
696	213328.96	728663.03	55.28	0.05
697	213338.98	728662.98	54.19	0.25
698	213348.88	728662.82	53.41	1.00
699	213359.03	728662.98	54.62	0.05
700	213368.99	728663.04	55.21	0.05
701	213378.96	728662.99	55.50	0.05
702	213389.01	728663.01	55.48	0.05
703	213399.04	728662.95	55.72	0.05
704	213409.05	728663.00	56.11	0.05
705	213418.98	728662.95	56.05	0.05
706	213429.01	728663.03	56.01	0.10
707	213439.03	728662.98	55.67	0.10
708	213229.01	728672.98	59.50	0.00
709	213239.04	728673.02	57.96	0.25
710	213249.05	728673.01	57.39	0.10
711	213259.07	728672.97	57.81	0.10
712	213269.01	728673.00	57.55	0.05
713	213279.07	728672.99	56.65	0.05
714	213289.01	728672.98	56.25	0.10
715	213299.04	728673.00	56.00	0.20
716	213309.02	728672.96	56.19	0.05
717	213319.01	728673.01	56.19	0.10
718	213328.99	728673.02	55.97	0.05
719	213339.02	728672.98	55.13	0.10
720	213349.02	728672.98	53.67	0.60

PROBE LOCATION	EASTING	NORTHING	LEVEL (mAOD)	SOFT SOIL / PEAT DEPTH (m BGL)
721	213359.00	728672.99	53.70	0.65
722	213368.98	728672.94	54.66	0.20
723	213378.93	728673.01	55.24	0.05
724	213389.04	728672.99	55.46	0.10
725	213399.00	728672.97	55.67	0.05
726	213409.06	728672.96	56.02	0.05
727	213419.01	728673.00	56.11	0.05
728	213429.03	728672.97	56.40	0.05
729	213438.98	728672.99	56.13	0.05
730	213449.03	728673.11	55.02	0.05
731	213239.02	728683.00	57.31	0.00
732	213249.02	728682.95	57.52	0.80
733	213258.98	728682.97	57.83	0.10
734	213268.97	728683.00	57.69	0.10
735	213278.99	728683.00	57.39	0.05
736	213288.99	728682.93	56.76	0.05
737	213298.95	728682.99	56.69	0.05
738	213309.00	728682.95	56.58	0.10
739	213318.96	728683.03	56.30	0.10
740	213329.03	728683.04	55.97	0.10
741	213338.99	728682.99	54.86	0.20
742	213349.04	728683.00	54.50	0.15
743	213358.92	728683.00	53.92	0.60
744	213368.97	728682.95	54.31	0.55
745	213378.98	728682.98	55.04	0.10
746	213389.01	728683.00	55.74	0.05
747	213398.98	728683.05	55.83	0.10
748	213409.03	728682.96	56.17	0.05
749	213418.97	728683.01	56.47	0.05
750	213429.02	728683.03	56.41	0.05
751	213439.00	728683.03	55.75	0.05
752	213449.05	728683.03	55.57	0.05
753	213249.00	728692.99	57.74	0.80
754	213258.96	728692.99	57.84	0.15
755	213269.04	728692.95	57.99	0.05
756	213279.03	728693.00	57.77	0.05
757	213288.99	728692.93	57.31	0.05
758	213299.03	728693.00	56.97	0.10
759	213309.01	728692.94	56.64	0.30
760	213318.99	728692.97	56.42	0.05
761	213328.97	728693.02	55.96	0.10
762	213339.05	728692.99	55.68	0.05
763	213349.03	728692.97	54.81	0.65
764	213359.02	728693.00	54.03	0.60
765	213369.01	728693.04	54.64	0.55
766	213379.05	728692.96	55.05	0.10
767	213389.02	728693.01	55.32	0.15
768	213399.02	728692.89	55.94	0.05

PROBE LOCATION	EASTING	NORTHING	LEVEL (mAOD)	SOFT SOIL / PEAT DEPTH (m BGL)
769	213409.03	728692.95	56.28	0.00
770	213419.03	728692.96	55.92	0.05
771	213429.05	728693.01	55.93	0.05
772	213438.97	728693.00	55.96	0.05
773	213449.04	728693.01	55.88	0.20
774	213459.06	728692.95	54.87	0.05
775	213259.02	728702.97	58.10	0.20
776	213269.04	728702.96	58.20	0.40
777	213278.99	728703.02	57.97	0.10
778	213288.98	728702.98	57.74	0.10
779	213299.04	728702.98	57.32	0.10
780	213308.96	728702.97	56.69	0.40
781	213319.02	728703.01	56.46	0.20
782	213329.03	728702.98	56.00	0.10
783	213339.01	728703.03	56.00	0.05
784	213348.97	728703.08	55.10	0.60
785	213359.02	728703.00	54.58	0.60
786	213369.01	728702.98	55.02	0.50
787	213378.98	728703.02	54.87	0.75
788	213389.00	728702.95	55.99	0.05
789	213399.03	728703.01	56.09	0.00
790	213408.96	728703.02	55.69	0.40
791	213418.99	728702.96	55.80	0.50
792	213429.03	728702.98	56.05	0.30
793	213439.04	728703.01	55.99	0.70
794	213448.99	728703.02	56.09	0.60
795	213459.00	728702.98	56.50	0.05
796	213469.02	728703.01	54.35	0.40
797	213259.05	728712.98	58.43	0.60
798	213269.03	728713.00	58.42	0.50
799	213279.02	728713.04	58.14	0.25
800	213288.97	728713.02	57.65	0.10
801	213298.98	728712.96	57.48	0.05
802	213308.99	728713.04	56.94	0.10
803	213319.00	728713.03	56.02	0.65
804	213328.99	728713.00	56.07	0.05
805	213338.99	728713.01	56.14	0.05
806	213349.01	728712.95	56.13	0.05
807	213359.00	728713.00	55.86	0.05
808	213369.04	728713.03	55.70	0.05
809	213378.99	728712.94	55.97	0.05
810	213389.05	728712.97	56.06	0.00
811	213398.95	728713.00	55.52	0.25
812	213409.01	728712.98	55.80	0.45
813	213419.01	728712.96	55.94	0.55
814	213429.07	728713.01	56.03	0.50
815	213438.98	728712.97	55.99	0.50
816	213449.03	728712.99	56.25	0.20

PROBE LOCATION	EASTING	NORTHING	LEVEL (mAOD)	SOFT SOIL / PEAT DEPTH (m BGL)
817	213268.99	728723.02	58.43	0.50
818	213278.96	728723.01	58.17	0.20
819	213289.00	728723.03	57.69	0.15
820	213298.98	728723.00	57.33	0.10
821	213309.02	728723.08	57.14	0.05
822	213319.00	728723.04	56.68	0.10
823	213329.00	728722.99	56.62	0.05
824	213339.02	728723.01	56.42	0.05
825	213348.99	728723.00	56.24	0.10
826	213359.04	728723.03	56.11	0.05
827	213369.03	728722.98	55.89	0.00
828	213379.00	728723.01	55.34	0.80
829	213389.02	728723.01	55.46	0.90
830	213398.98	728722.98	55.49	1.00
831	213408.99	728722.99	55.83	0.45
832	213418.98	728722.97	56.03	0.50
833	213429.03	728723.03	55.98	0.65
834	213438.96	728723.02	56.06	0.75
835	213279.07	728733.00	58.42	1.00
836	213288.99	728732.95	57.81	0.10
837	213299.01	728732.98	57.22	0.75
838	213309.00	728733.00	57.02	0.10
839	213318.95	728732.97	56.87	0.05
840	213329.00	728732.96	56.94	0.05
841	213339.00	728732.96	56.76	0.05
842	213349.00	728733.01	56.35	0.05
843	213358.98	728732.94	55.97	0.05
844	213368.99	728733.05	55.49	1.00
845	213379.00	728732.97	55.53	0.70
846	213389.00	728732.96	55.57	1.00
847	213398.99	728733.03	55.67	1.15
848	213409.01	728733.00	55.74	0.65
849	213418.95	728732.99	55.83	0.20
850	213429.01	728732.94	56.09	0.55
851	213278.97	728742.92	58.32	0.20
852	213289.03	728743.02	57.91	0.15
853	213299.02	728742.98	57.63	1.40
854	213308.98	728743.06	56.98	1.00
855	213319.05	728743.02	56.98	0.10
856	213329.00	728743.04	57.00	0.05
857	213339.05	728742.97	56.72	0.05
858	213348.99	728743.00	56.03	0.10
859	213359.04	728742.99	55.86	1.30
860	213369.05	728742.99	55.71	1.00
861	213379.04	728742.99	55.72	0.50
862	213389.02	728743.03	55.58	0.60
863	213398.99	728742.95	55.71	2.20
864	213409.02	728742.98	55.79	0.60

PROBE LOCATION	EASTING	NORTHING	LEVEL (mAOD)	SOFT SOIL / PEAT DEPTH (m BGL)
865	213419.03	728742.99	55.88	0.65
866	213289.05	728752.96	58.73	0.20
867	213299.02	728752.98	57.55	0.75
868	213309.03	728752.93	57.14	0.50
869	213319.01	728752.99	56.84	0.20
870	213329.02	728753.02	56.69	0.05
871	213339.03	728753.04	56.10	0.70
872	213349.06	728752.98	55.83	0.65
873	213359.00	728752.99	55.93	1.40
874	213369.05	728753.03	55.92	0.55
875	213378.99	728753.00	56.20	1.00
876	213388.97	728752.94	55.92	0.45
877	213399.03	728753.02	55.94	0.50
878	213299.04	728762.99	57.39	1.35
879	213309.04	728763.01	57.10	1.40
880	213319.01	728762.99	56.73	1.25
881	213329.02	728762.99	56.39	1.65
882	213339.03	728762.95	56.17	0.70
883	213349.02	728763.02	56.23	1.60
884	213358.99	728762.97	56.24	1.20
885	213369.03	728762.98	56.28	1.10
886	213378.97	728763.02	56.36	0.70
887	213389.02	728762.99	56.17	0.60
888	213309.00	728772.99	56.92	0.45
889	213319.04	728772.95	56.71	0.80
890	213329.02	728772.99	56.39	1.20
891	213339.02	728772.97	56.32	0.65
892	213348.99	728772.97	56.29	1.00
893	213359.03	728773.02	56.30	0.70
894	213368.97	728773.01	56.38	1.00
895	213378.96	728773.00	56.44	1.00
896	213309.01	728783.05	57.06	0.80
897	213319.01	728782.97	56.70	0.55
898	213328.99	728783.04	56.67	1.40
899	213339.01	728782.97	56.57	0.70
900	213348.97	728783.01	56.73	1.75
901	213359.05	728782.99	56.60	1.15
902	213319.04	728793.00	56.80	1.25
903	213328.98	728792.99	56.84	0.70
904	213339.00	728793.00	56.82	1.15
905	213348.97	728792.99	56.81	1.00
906	213329.01	728803.00	57.09	1.20
907	213339.00	728803.01	56.90	1.35

6762 CRUACHAN 2 LAY DOWN AREA - PEAT SAMPLING & TESTING

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PROBE LOCATION	SOFT SOIL / PEAT DEPTH (m BGL)	PHOTO	FIRMNESS OF SURFACE [P0-P3]	VEG IN 15M	VON POST [H1-H10]	FINE FIBRES [F0-F3]	ROOT FIBRES [R0-R3]	WOOD REMAINS [W0-W3]	HV @0.50 KPa	HV @1.00 KPa	HV @1.50 KPa	HV @2.00 KPa	SAMPLE	DESCRIPTION
10	1.05		P3	ROUGH GRASS, MOSS	H6	F2	R1	W1	26	28			0.55-1.05	Very soft dark brown pseudo fibrous PEAT.
197	0.70		P2	ROUGH GRASS, MOSS	H7	F2	R1	W0	21				0.20-0.70	Very soft dark brown pseudo fibrous PEAT.
220	1.30		P2	ROUGH GRASS, MOSS	H7	F1	R1	W1	12	15			0.80-1.30	Very soft dark brown pseudo fibrous PEAT.
244	1.35		P2	ROUGH GRASS, MOSS	H8	F1	R1	W1	18	18			0.85-1.35	Very soft dark brown and brown pseudo fibrous PEAT.
327	1.50		P1	ROUGH GRASS, MOSS, RUSH	H7	F1	R2	W0	18	32	42		1.00-1.50	Very soft dark brown slightly sandy pseudo fibrous PEAT. Ground rutted. Next to burn.

6762 CRUACHAN 2 LAY DOWN AREA - PEAT SAMPLING & TESTING

SKF Ltd
Ground Investigation & Site Surveys

PROBE LOCATION	SOFT SOIL / PEAT DEPTH (m BGL)	PHOTO	FIRMNESS OF SURFACE [P0-P3]	VEG IN 15M	VON POST [H1-H10]	FINE FIBRES [F0-F3]	ROOT FIBRES [R0-R3]	WOOD REMAINS [W0-W3]	HV @0.50 KPa	HV @1.00 KPa	HV @1.50 KPa	HV @2.00 KPa	SAMPLE	DESCRIPTION
349	1.45		P1	ROUGH GRASS, MOSS, RUSH	H7	F1	R2	W0	18	20			0.95-1.45	Very soft dark brown pseudo fibrous PEAT. Ground rutted.
389	1.75		P2	ROUGH GRASS, MOSS, RUSH	H7	F1	R2	W0	18	20	38		1.25-1.75	Very soft dark brown pseudo fibrous PEAT.
412	1.20		P1	ROUGH GRASS, MOSS, RUSH	H7	F1	R1	W0	18	24			0.70-1.20	Very soft dark brown pseudo fibrous PEAT. Slightly sandy at base. Standing water / flooded
467	1.95		P2	ROUGH GRASS, MOSS, RUSH	H7	F1	R1	W0	23	25	30		1.45-1.95	Very soft dark brown pseudo fibrous PEAT.
501	1.25		P2	ROUGH GRASS, MOSS, RUSH	H8	F1	R1	W0	26	34			10.75-1.25	Very soft dark brown pseudo fibrous PEAT.

6762 CRUACHAN 2 LAY DOWN AREA - PEAT SAMPLING & TESTING

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PROBE LOCATION	SOFT SOIL / PEAT DEPTH (m BGL)	PHOTO	FIRMNESS OF SURFACE [P0-P3]	VEG IN 15M	VON POST [H1-H10]	FINE FIBRES [F0-F3]	ROOT FIBRES [R0-R3]	WOOD REMAINS [W0-W3]	HV @0.50 KPa	HV @1.00 KPa	HV @1.50 KPa	HV @2.00 KPa	SAMPLE	DESCRIPTION
552	1.55		P2	ROUGH GRASS, MOSS, RUSH	H7	F1	R1	W1	18	20	32		1.05-1.55	Very soft dark brown pseudo fibrous PEAT.
575	1.95		P2	ROUGH GRASS, MOSS, RUSH	H8	F1	R1	W0	24	26	22		1.45-1.95	Very soft dark brown pseudo fibrous PEAT.
599	1.40		P1	ROUGH GRASS, MOSS, RUSH	H7	F2	R1	W1	26	26			0.90-1.40	Very soft dark brown pseudo fibrous PEAT. Standing water / flooded
619	2.00		P2	ROUGH GRASS, MOSS	H7	F1	R1	W1	24	28	28	42	1.50-2.00	Very soft dark brown pseudo fibrous PEAT.
644	1.30		P1	ROUGH GRASS, MOSS	H8	F1	R1	W0	18	38			0.80-1.30	Very soft dark brown pseudo fibrous PEAT. Locally dark greyish brown. Close to road. Standing water / flooded

6762 CRUACHAN 2 LAY DOWN AREA - PEAT SAMPLING & TESTING

SKF Ltd
Ground Investigation & Site Surveys

PROBE LOCATION	SOFT SOIL / PEAT DEPTH (m BGL)	PHOTO	FIRMNESS OF SURFACE [P0-P3]	VEG IN 15M	VON POST [H1-H10]	FINE FIBRES [F0-F3]	ROOT FIBRES [R0-R3]	WOOD REMAINS [W0-W3]	HV @0.50 KPa	HV @1.00 KPa	HV @1.50 KPa	HV @2.00 KPa	SAMPLE	DESCRIPTION
863	2.20		P1	ROUGH GRASS, MOSS	H7	F2	R2	W0	18	20	34	34	1.70-2.20	Very soft brown pseudo fibrous PEAT. Standing water / flooded
881	1.65		P2	ROUGH GRASS, RUSH	H8	F1	R1	W0	16	20	20		1.15-1.65	Very soft dark greyish brown pseudo fibrous PEAT. Slightly sandy.
883	1.60		P1	ROUGH GRASS, MOSS	H8	F1	R1	W0	12	16	18		1.10-1.60	Very soft dark brown pseudo fibrous PEAT.
890	1.20		P1	ROUGH GRASS, MOSS	H7	F1	R1	W0	26	34			0.70-1.20	Very soft dark brown pseudo fibrous PEAT. Slightly sandy at base. Standing water / flooded
900	1.75		P1	ROUGH GRASS, MOSS	H8	F1	R1	W1	20	26	30		1.25-1.75	Very soft dark brown pseudo fibrous PEAT. Traces of sand and gravel.

6762 CRUACHAN 2 LAY DOWN AREA - PEAT SAMPLING & TESTING

SKF Ltd
Ground Investigation & Site Surveys

PROBE LOCATION	SOFT SOIL / PEAT DEPTH (m BGL)	PHOTO	FIRMNESS OF SURFACE [P0-P3]	VEG IN 15M	VON POST [H1-H10]	FINE FIBRES [F0-F3]	ROOT FIBRES [R0-R3]	WOOD REMAINS [W0-W3]	HV @0.50 KPa	HV @1.00 KPa	HV @1.50 KPa	HV @2.00 KPa	SAMPLE	DESCRIPTION
904	1.15		P1	ROUGH GRASS, MOSS	H8	F1	R1	W0	16	18			0.65-1.15	Very soft dark brown pseudo fibrous PEAT.

LABORATORY TEST CERTIFICATE

MATtest Limited
materials testing & consultancy

10 Queenslie Point
Queenslie Industrial Estate
120 Stepps Road
Glasgow
G33 3NQ

Tel: 0141 774 4032

email: info@mattest.org
Website: www.mattest.org

Certificate No : **22/484 - 01**

To : **Scott Farquhar**

Client : **SKF Ltd.**
Constablewood Estate
Brisbane Glen
Largs
KA30 8SN

LABORATORY TESTING OF SOIL

Introduction

We refer to samples taken from Cruachan 2 Lay Down Area and delivered to our laboratory on 22nd April 2022.

Material & Source

Sample Reference	:	See Report Plates
Sampled By	:	Client
Sampling Certificate	:	Not Supplied
Location	:	See Report Plates
Description	:	See Page 2
Date Sampled	:	Not Supplied
Date Tested	:	22nd April 2022 Onwards
Source	:	6762 - Cruachan 2 Lay Down Area

Test Results

As Detailed On Page 2 to Page 6 inclusive

Comments

The results contained in this report relate to the sample(s) as received
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
All remaining samples for this project will be disposed of 28 days after issue of this test certificate

Remarks

Approved for Issue

T McLelland (Director)

Date 06/05/2022

UKAS TESTING
2643

MATtest Limited
materials testing & consultancy

BOREHOLE	SAMPLE	DEPTH (m)	
10	C	0.55-1.05	
197	C	0.20-0.70	
220	C	0.80-1.30	
244	C	0.85-1.35	
327	C	1.00-1.50	
349	C	0.95-1.45	
389	C	1.25-1.75	
412	C	0.70-1.20	
467	C	1.45-1.95	
501	C	10.75-11.25	
552	C	1.05-1.55	
575	C	1.45-1.95	
599	C	0.90-1.40	
619	C	1.50-2.00	
644	C	0.80-1.30	
863	C	1.70-2.20	
881	C	1.15-1.65	
883	C	1.10-1.60	
890	C	0.70-1.20	
900	C	1.25-1.75	
904	C	0.65-1.15	

SUMMARY OF SAMPLES

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)
10	C	0.55-1.05	547
197	C	0.20-0.70	465
220	C	0.80-1.30	720
244	C	0.85-1.35	598
327	C	1.00-1.50	239
349	C	0.95-1.45	704
389	C	1.25-1.75	508
412	C	0.70-1.20	403
467	C	1.45-1.95	558
501	C	10.75-11.25	722
552	C	1.05-1.55	711
575	C	1.45-1.95	765
599	C	0.90-1.40	557
619	C	1.50-2.00	560
644	C	0.80-1.30	691
863	C	1.70-2.20	801
881	C	1.15-1.65	397
883	C	1.10-1.60	697
890	C	0.70-1.20	319
900	C	1.25-1.75	463
904	C	0.65-1.15	783

Tested in accordance with BS 1377: Part 2: 1990: Clause 3

SUMMARY OF MOISTURE CONTENT TEST RESULTS

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	BULK DENSITY (Mg/m^3)	DRY DENSITY (Mg/m^3)
10	C	0.55-1.05	547	1.02	0.16
197	C	0.20-0.70	465	1.03	0.18
220	C	0.80-1.30	720	1.08	0.13
244	C	0.85-1.35	598	1.05	0.15
327	C	1.00-1.50	239	1.05	0.31
349	C	0.95-1.45	704	1.04	0.13
389	C	1.25-1.75	508	1.07	0.18
412	C	0.70-1.20	403	1.08	0.21
467	C	1.45-1.95	558	1.05	0.16
501	C	10.75-11.25	722	1.05	0.13
552	C	1.05-1.55	711	1.04	0.13
575	C	1.45-1.95	765	1.03	0.12
599	C	0.90-1.40	557	1.05	0.16
619	C	1.50-2.00	560	1.07	0.16
644	C	0.80-1.30	691	1.03	0.13
863	C	1.70-2.20	801	1.05	0.12
881	C	1.15-1.65	397	1.03	0.21
883	C	1.10-1.60	697	1.05	0.13
890	C	0.70-1.20	319	1.08	0.26
900	C	1.25-1.75	463	1.04	0.18
904	C	0.65-1.15	783	1.04	0.12

Tested in accordance with BS1377 Part 2 : 1990
Bulk Density : Linear Measurement

SUMMARY OF MOISTURE CONTENT AND DENSITY TEST RESULTS

BOREHOLE	SAMPLE	DEPTH (m)	SPECIMEN § ORIENTATION	SAMPLE PASSING 2mm SIEVE (%)	SULPHIDES DETECTED IN SAMPLE	CHLORIDES DETECTED IN SAMPLE	AVERAGE ORGANIC CONTENT (%)
327	C	1.00-1.50	N/A	98	N	N	19.9
412	C	0.70-1.20	N/A	99	N	N	16.2
467	C	1.45-1.95	N/A	96	N	N	24.0
881	C	1.15-1.65	N/A	99	N	N	19.9
890	C	0.70-1.20	N/A	94	N	N	17.6
900	C	1.25-1.75	N/A	95	N	N	23.5

All samples tested in accordance with Clause 4 of BS 1377: Part 3 : 2018 + A1 2021.
All tests performed on fraction of sample passing 2mm sieve

§ Specimen orientation :

N/A	Not applicable due to preparation method and/or sample type
V	Cut vertically from undisturbed sample
H	Cut horizontally from undisturbed sample

SUMMARY OF ORGANIC MATTER CONTENT TEST RESULTS

BOREHOLE	SAMPLE	DEPTH (m)	% MATERIAL LESS THAN 2mm	LOSS ON IGNITION (%)
10	C	0.55-1.05	86	78.4
197	C	0.20-0.70	92	76.3
220	C	0.80-1.30	95	86.3
244	C	0.85-1.35	94	87.6
349	C	0.95-1.45	99	75.0
389	C	1.25-1.75	85	76.4
501	C	10.75-11.25	93	93.5
552	C	1.05-1.55	92	91.0
575	C	1.45-1.95	98	82.4
599	C	0.90-1.40	96	80.6
619	C	1.50-2.00	93	65.3
644	C	0.80-1.30	79	92.6
863	C	1.70-2.20	96	96.5
883	C	1.10-1.60	86	79.3
904	C	0.65-1.15	90	79.1

All samples tested in accordance with Clause 6 of BS 1377: Part 3: 2018 + A1 2021. All tests performed on fraction of sample passing 2mm sieve

§ Specimen orientation :

N/A	Not applicable due to preparation method and/or sample type
V	Cut vertically from undisturbed sample
H	Cut horizontally from undisturbed sample

SUMMARY OF MASS LOSS ON IGNITION TEST RESULTS

From: Szylak, Stuart <Stuart.Szylak@stantec.com>
Sent: 08 November 2022 08:34
To: McKenzie JR (James); Planning SW
Cc: Brogan A (Alan); Econsents Admin; Martin, Alexa; Fraser, Lynsey
Subject: ECU00004492: Electricity Act 1989 section 36: consultation - Cruachan Expansion Project
Attachments: SEPA holding objection response.pdf

Good morning James.

FAO: Simon Watt, Senior Planning Officer, SEPA
SEPA ref: **5487**

Further to SEPA's holding objection letter of 30 August to the Government's Energy Consents Unit, requesting further details and information, I am pleased to attach a response on behalf of the applicant.

I trust that this is sufficient information to allow SEPA to complete its formal response, but please get in touch if you require any other details.

Many thanks

Stuart

Stuart Szylak BSc(hons)
Associate Environmental Planner

Edinburgh (Charlotte Lane) SCT Office
stuart.szylak@Stantec.com

Mobile: +44 (0) 7843819022

Stantec

SEPA Ref: 5487
ECU Ref: ECU00004492

08 November 2022

Stantec UK Limited
5th Floor, Lomond House
9 George Square
Glasgow
G2 1DY

James McKenzie
Energy Consents Unit
Scottish Government
4th Floor, 5 Atlantic Quay
150 Broomielaw
Glasgow
G2 8LU

Attention of: Simon Watt – Scottish Environment Protection Agency

Dear James,

The Electricity Works (EIA) (Scotland) Regulations 2017
Application For Consent Under Section 36 of the Electricity Act 1989 For Construction And Operation Of The Cruachan Expansion Project Within The Planning Authority Of Argyll And Bute Council

In response to the SEPA holding objection letter of 30 August 2022 I am pleased to respond on all the matters raised in such. This response is split into 3 topic sections: hydrogeological / groundwater issues; site ecology; and flood risk. Furthermore, responses are referenced in accordance with the paragraph numbering in the SEPA letter. **Appendix 1** herein presents our responses.

As per SEPA comment we would be accepting of planning conditions being attached to the consent to provide a Site Waste Management Plan, Habitat Restoration and Landscape Mitigation Plan and Peat Management Plan for agreement and approval.

You will be aware that a CAR application is currently being prepared and that discussions are ongoing with the SEPA Water Permitting Team regarding project permitting requirements.

I trust the responses are clear but please get in touch again if you wish to discuss any matters relating to the proposals.

Yours Sincerely,

Stuart Szylak
Associate Environmental Planner
on behalf of Stantec UK Ltd

Appendix 1

SEPA Holding Objection – Stantec Responses

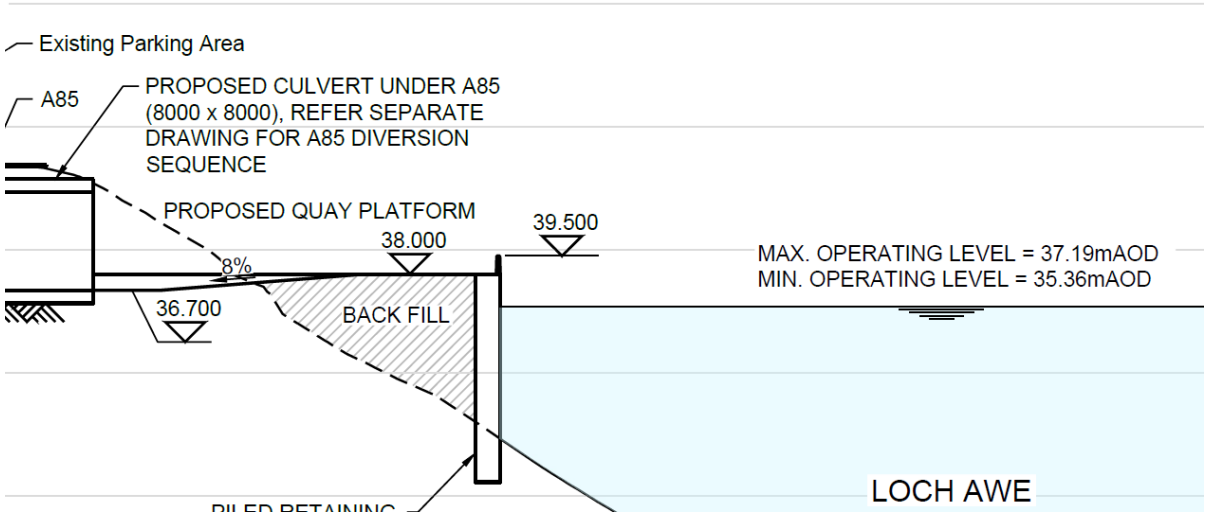
SEPA Appendix 1 ref	SEPA Comment	Stantec comments
1.1 bullet (1	Further details on PWS and risk assessment for those identified.	The Environmental Impact Assessment Report (EIAR) states there are 17 private water supplies located within and adjacent to a 5km buffer of the Proposed Development (Section 7.5.20 refers). Table 7.6 within the EIAR provides background information on all of these and EIAR Figure 7.1 plots the location of these on a map. Table 6.9 and section 7.5.21 indicates that, at the time of preparing the EIAR, no further data was available on the licenced abstractions. Section 7.7 of the EIAR presents embedded mitigation and Section 7.9.2 concludes implementation of the CEMP will mitigate any likely impacts on PWS.
1.1 bullet (2	Further work to understand the potential at the site for the geology to generate acidic leachates and acid rock drainage and to evaluate the appropriate material reuse geotechnically as fill materials and also as concrete aggregates as per Section 1.7.4 of EIAR Appendix 6.1 – Preliminary Investigation Report on Ground Conditions. This should be provided at this stage as potential end uses (within and outwith the site boundary) and associated transportation will be heavily influenced by the acid and metal generating potential of the material.	We agree with SEPA that further work is required to understand the potential acid generating risk, as per the conclusion of the Potential Acid Generating Geology Site Visit Report. However, it is considered that a full acid rock drainage (ARD) assessment at the EIA stage, prior to any initial planning decision, is not proportionate in this case, particularly given the time and cost associated with such an assessment. The intention is for the full ARD assessment to be carried out as part of the detailed ground investigation phase of the project, to make efficient use of the boreholes and samplings being carried out at that stage (deep vertical and horizontal cored boreholes will be required). The ARD assessment will therefore, to a certain extent, be informed by pre-construction ground investigation works and the applicant would be happy to consider the wording of an appropriately worded condition that required the ARD assessment to be carried out at an appropriate time between consent and construction works.

		Regarding the comments on potential end uses and transport implications of excavated rock, this is currently unknown and will be informed by studies, and decisions made, by the principal contractor once appointed.
4.1	Further information regarding groundwater dependent flush habitats.	Existing flushes at the proposed upper works areas were not mapped as they are way below the minimum mappable unit for survey purposes (ie they are a matter of between a few centimetres across up to a few metres) (section 8.5.5 of EIAR). The proposed at-or-near-surface structures at the upper works is limited to the gate hoist structure at the upper intake. The positioning of this, together with the rock excavations required to accommodate this, is largely fixed in position (i.e. no micrositing is achievable for these structures). Section 3.51 of EIAR Appendix 8.1 discusses the small flushes that do exist in the vicinity of these works. Section 8.9.11 of the EIAR confirms that where these exist in areas required for construction at the upper works they will be impacted. The temporary upper site compound area, proposed to be located on the flatter areas in the vicinity of the existing dam, could be microsited to avoid any existing flushes, should these be considered sensitive by the Ecological Clerk of Works. With regards to the proposed lower works construction compound, a large area in excess of 50 hectares is identified within the red-line application boundary to accommodate this. However, it is expected that only approximately 9 hectares will be required for this compound. Where this compound is ultimately sited will be a decision made by the principal contractor at the detailed design stage. The ultimate location will be informed by, amongst other things, environmental constraints such as topography, flush habitats and peat depth. Where possible the compound location could be microsited to avoid any existing flushes, should these be considered particularly sensitive by the Ecological Clerk of Works.
4.2	Request for outline Habitat Restoration and Landscape Mitigation Plan.	Outline details regarding habitat restoration and enhancement are included in section 8.10.4 and 11.8 of the EIAR. The exact locational specifics of where habitat and landscape restoration will be required, and what this may comprise, is not yet known. Once a principal contractor agrees the location of temporary

		construction compounds the location specific mitigation can be submitted and agreed. The applicant is happy to receive an appropriately worded planning condition to produce a full Habitat Restoration and Landscape Mitigation Plan to address impacts to habitats and peat.
4.3	Further information must be provided on the layout of the Lower Site Compound and the requirement to excavate at this location. The applicant should clarify if alternative locations for the Lower Site Compound were considered, if excavation can be avoided where peat depth is greater than 0.5 metre and if there are flushes in the Lower Site Compound area and how will these be managed.	A large area in excess of 50 hectares is identified within the red-line application boundary to accommodate the Lower Site Compound. However, it is expected that only approximately 9 hectares will be required for the lower site compound. For assessment purposes several locations within this red-line area, east of Lochawe, were appraised for possible main works compound areas. However, topography, overhead lines, agricultural requirements, flooding, road access, watercourses, visual impact and obvious surface peat features pointed towards a logical location alongside the A85, in the west of the application boundary. This is the location that has been utilised for assessment purposes. The specific location and layout of the compound area has not yet been established and this will be up to the principal contractor, once appointed, to consider, appraise and agree. Given the ground conditions, it is very likely that there will be a requirement to excavate within the compound area to provide suitable and stable surfaces. Figure 10.2 of the Outline Peat Management Plan presents a Peat Depth Plan of the compound area utilised for assessment purposes. This shows a majority of the compound having peat depths between 0m and 0.5m. There are limited areas where peat depths are 1.5m to 2m. It is not possible to say at this time whether excavation can be avoided where peat depth is between 0.5 and 2 metres. Small flushes were identified within the lower site compound area but were not mapped as they are way below the minimum mappable unit for survey purposes (ie they are a matter of between a few centimetres across up to a few metres) (section 8.5.14 of EIAR). As explained in response 4.1, where possible the compound location/excavation areas could be microsited to avoid any existing flushes, should these be considered particularly sensitive by the Ecological Clerk of Works.
4.4	The Peat Depth Plan (EIAR Figure 6.2) shows that the majority of the Lower Site Compound area is underlain by peaty soil, with peat depth less than 0.5 metre, with the exception of pockets of deeper peat, and an area of deeper peat at the	Taking in to account the SEPA comment requesting the peat volume where excavation is >0.5m only, we have revised the estimated peat volume for the lower compound area. The revised estimate is for the whole 9ha compound area, as used for assessment purposes. An update to section 6.3 of appendix 6.2 Outline Peat Management Strategy of the ground conditions chapter can be reworded as follows.

<table>
<tr>
<td></td>
<td>north east end of the survey area. The estimated volume of peat to be excavated, provided in Table 3 of EIAR Appendix 6.2 – Outline PMP, includes where peat depth is less than 0.5 metres. While we appreciate the conservative worst case nature of this estimate, we also require the actual peat volume (i.e. excluding the excavation locations where peat depth is less than 0.5 metres).</td>
<td>
<h3>Peat Excavation Estimated Volumes</h3>
6.3.4 The table below indicates the peat excavation requirement calculated using data from investigations to date. This calculated volume estimate excludes the excavation locations where ‘peat’ depth is less than 0.5m, in line with SEPA comments received following submission.
6.3.5 These preliminary calculations suggest that during the development of the site an estimated 8,700m^3 of peat will require to be excavated to allow the construction of the temporary and permanent above ground elements of the Proposed Development.
Table 3 Peat Excavation Requirement Calculated Using Data from Investigations to Date
<table>
<tr><th>Measurement</th><th>Peat excavation footprint for site infrastructure</th></tr>
<tr><td>Area, m^2</td><td>90,000</td></tr>
<tr><td>Volume, m^3</td><td>8,700</td></tr>
</table>
6.3.6 Within the detailed design stage final Peat Management Plan, it is expected that actual volume of peat may reduce subject to data obtained from further investigation and testing and detailed design of the lower compound excavation requirements.
</td>
</tr>
<tr>
<td>4.5</td>
<td>We also require further detailed information on the compound excavation requirements. As the Lower Site Compound area is 9 hectares, the applicant should clarify if excavation to the underlying mineral layer is required across the</td>
<td>It is not yet possible to provide detailed information on the compound excavations required. Once a principal contractor is engaged, detailed design progressed, and detailed surveys undertaken the extent of excavations at the compound areas can be confirmed.</td>
</tr>
</table>

	full extent of this area and whether any of the compound site can be floated.	How the compounds will be used by the principal contractor is not currently known. It is expected that a majority of the compound area will be used for open storage, these areas can perhaps be more flexible in their location and less sensitive to ground conditions. Engineering solutions to mitigate impacts of excavations (such as floated foundations) will be utilised if required. The applicant is happy to agree to an appropriately worded planning condition to ensure excavation requirements are fully understood, mitigated and ultimately agreed on prior to any construction work.
4.6	Further information on the potential off-site reuse locations must be obtained by the applicant as soon as possible. In reinstating disturbed margins of the development area, any peat re-used must not project above the pre-development surrounding/adjacent undisturbed ground level; this is to minimise the risk of drying and losing carbon. Restoration of bare peat areas (e.g. where previous compounds have been located including that in the upper site area which was stripped for filming recently), reprofiling of hags, infilling hollows or drains should be the top priorities for re-use of excavated peat given the greater environmental benefit of these activities compared to placement at infrastructure edges.	The applicant agrees that reinstatement and re-use of peat is an important consideration. Definitive locations for such will need to be agreed with third parties/landowners and will be heavily influenced by the detail established by further studies, compound design, excavated peat volumes etc. Should SEPA require information on potential re-use locations this could be provided by way of a geo-referenced photo log. Updated calculations regarding potential peat excavation is provided in response 4.4 above. Peat re-use, restoration and reinstatement measures and strategy can be presented within the final Peat Management Plan and agreed prior to works commencing.
4.7	We require further information on the volumes of peat that can be re-used in each potential re-use activity and location. Whilst it is appreciated that further information will become available at detailed design and after further ground investigation, we require an outline assessment	Should SEPA require information on potential re-use locations prior to consent this could be provided by way of a geo-referenced photo log. The possible volume of peat that could be re-used at each location could be estimated. Updated calculations regarding potential peat excavation is provided in response 4.4 above.

	of the fate of all peat that is estimated to be excavated to facilitate the development prior to consent.	
5.3	New flood wall height should protect against 1 in 200 year flood event to protect essential infrastructure.	The proposed flood wall along the new quayside has a height of 39.5m AOD. The maximum operating level of Loch Awe is 37.19m AOD. Once/if water levels in the loch got to 37.19m AOD the hydro scheme would shut down. There is therefore no circumstance where the 1 in 200 year flood event would force the shut-down of the scheme, it would be shut down well in advance of such water levels in the loch.  Although the power station would be shut down when water levels in the loch exceeded 37.19m there is still the possibility of the proposed flood wall being breached and the new quayside and structures being flooded during an extreme flood event. The application does show a new admin building on the quayside, but there is an option to continue to utilise the existing admin building for operating both Cruachan 1 and 2 schemes. This has yet to be confirmed. Worst case assumes the

		new admin building will be constructed and used for personnel. A new store building is also proposed on the new quayside. If there was ever a situation where the quayside became flooded, including the proposed admin and store buildings, the hydro scheme would already have been shut down well before this event. Any staff within the admin building on the quayside would have been evacuated well in advance. Any other staff within the main cavern or access tunnels would also have a safe route of evacuation in the event of extreme flood levels. The main access tunnel is designed to prevent flood water entering the main power cavern. The main access tunnel is designed with an initial downhill section at the entrance (where it routes under the A85 road and the railway) then there is an incline. This incline rises to 41.10m and effectively acts as barrier to prevent water ingress, thereby protecting the main power cavern. Thereafter the main access tunnel slopes down below the level of Loch Awe to the turbine hall. There are internal link tunnels proposed from Cruachan 2 to Cruachan 1 infrastructure, which will allow staff and operatives another route of exit in the event of an extreme flood event.

From: Szylak, Stuart <Stuart.Szylak@stantec.com>
Sent: 23 November 2022 12:11
To: Watt, Simon
Cc: McKenzie JR (James); Econsents Admin; Martin, Alexa; Fraser, Lynsey
Subject: RE: ECU00004492: Electricity Act 1989 section 36: consultation - Cruachan Expansion Project
Attachments: PAG HHXRF data.pdf; PAG site visit report_rev01.pdf

Good afternoon Simon,

Further to your request please find attached for your information the whole Cruachan 2 – Potential Acid Generating Geology Site Visit – Report, and the hand-held x-ray fluorescence results table. This report is summarised in the main EIA Report.

I trust this information will be of use in compiling your formal response to ECU.

Many thanks

Stuart

From: Watt, Simon <simon.watt@sepa.org.uk>
Sent: 17 November 2022 12:33
To: Szylak, Stuart <Stuart.Szylak@stantec.com>
Cc: James.McKenzie@gov.scot; Alan.Brogan@gov.scot; Martin, Alexa <Alexa.Martin@stantec.com>; Fraser, Lynsey <Lynsey.Fraser@stantec.com>
Subject: RE: ECU00004492: Electricity Act 1989 section 36: consultation - Cruachan Expansion Project

OFFICIAL

Hi Stuart,

Further to your message below, in relation to the potential for acid generating leachates and acid rock drainage at the site would it be possible to share the 2022 non-intrusive assessment (referred to within Section 1.7.3 of EIAR Appendix 6.1) with us? And is that the same as the Potential Acid Generating Geology Site Visit Report referenced in your letter? If there's any way at this stage you can provide information to help us understand the potential scale of the issue (i.e best or worst case scenarios in terms of potential volume of material affected) that'll give us much more to go on to inform our position (including in relation to the use of a planning condition).

Kind regards,
Simon

Simon Watt
Senior Planning Officer
Scottish Environment Protection Agency (SEPA)
email: planning.sw@sepa.org.uk
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OFFICIAL

From: Szylak, Stuart <Stuart.Szylak@stantec.com>
Sent: 08 November 2022 08:34
To: James.McKenzie@gov.scot; Planning SW <planning.sw@sepa.org.uk>
Cc: Alan.Brogan@gov.scot; Econsents_Admin@gov.scot; Martin, Alexa <Alexa.Martin@stantec.com>; Fraser, Lynsey <Lynsey.Fraser@stantec.com>
Subject: ECU00004492: Electricity Act 1989 section 36: consultation - Cruachan Expansion Project

Good morning James.

FAO: Simon Watt, Senior Planning Officer, SEPA
SEPA ref: **5487**

Further to SEPA's holding objection letter of 30 August to the Government's Energy Consents Unit, requesting further details and information, I am pleased to attach a response on behalf of the applicant.

I trust that this is sufficient information to allow SEPA to complete its formal response, but please get in touch if you require any other details.

Many thanks

Stuart

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Stantec

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Project Memo

Date/Time:	January 21, 2022	Doc No: 331201086 /01/TM/PAG
From:	Stantec UK Ltd	
To:	Drax Cruachan Expansion Ltd	
Subject:	**Cruachan 2 – Potential Acid Generating Geology Site Visit - Report**	

1. Background and Purpose of this Memo

Arising from the client meeting on 15th September it is understood there is a desire for a geologist's opinion on the level of risk of sulphide minerals such as pyrite in the rock that will be excavated from the tunnels and cavern at the proposed Cruachan 2 project. This mineral can be found in disseminated throughout the rock, along open fissures, and in enclosed veins. Where present these may oxidise naturally over time when exposed to air and water to generate sulphuric acid and dissolved iron and other minerals through a process known as acid rock drainage (ARD). In that meeting it was agreed that the most expedient way to get an opinion ahead of the formal ground investigation or borehole testing would be for Stantec geologists to go to site and observe the rock faces within the existing Cruachan complex access tunnel and machine hall and extrapolate findings to the proposed Cruachan 2 excavations. This note presents the summary of the site visit and associated opinion regards preliminary ARD risk for the Cruachan 2 excavation. An outline of this visit is given in **section 3 and 4 below**.

Stantec's assessment aims only to identify potentially acid generating (PAG) rock types and formations and those that may provide neutralisation potential such as carbonate rich mineralisation (such as calcite). Non-acid generating (NAG) rocks are equally important to define as these can be utilised to undertake acid-based accounting of the excavated rock mass of the future additions to the complex in efforts to understand the potential to generate acidic leachates or acid rock drainage.

2. Geology

Summary

There are two main rock types and several minor types when considering the likely ARD risk at the site. The published BGS geological mapping indicates that the project is located on the contact between the Dalradian Group of metasediments known as Ardrishaig Phyllite Formation of Neoproterozoic age to the southwest, and the late Devonian Quarry Intrusion to the northeast which is part of the Etive Pluton. This contact is observed at the site in surface outcrops and within existing underground workings within the Cruachan Power Station as a change from a Phyllite to a Quartz-Diorite across a contact zone where apparent xenoliths of the country rock (phyllites) were present within the Quartz-Diorite (visible in the walls of the access tunnel). This contact is indicated on figure 1 below.

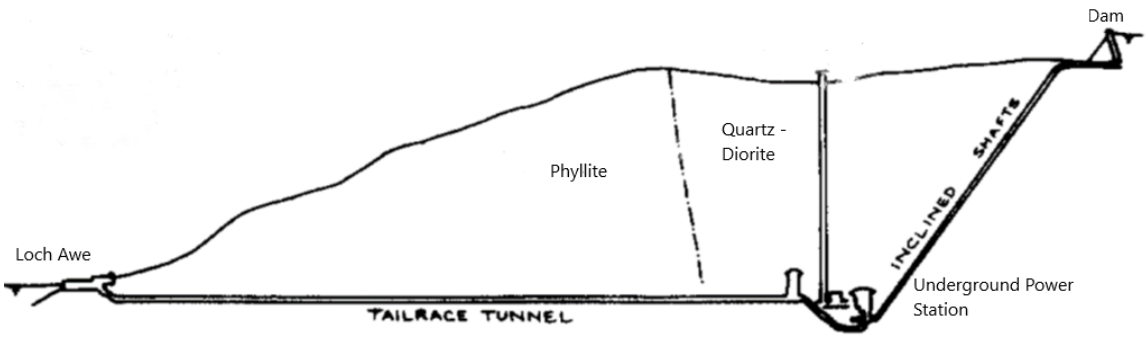

Figure 1 Sketch representation of distribution of rock types at the Cruachan site.

The contact is observed in the access and tailrace tunnels to the south of the machine hall, with the Ardrishaig Phyllite Formation to the southern side and Quarry Intrusion Quartz-Diorite on the northern side (encompassing the machine hall and other upstream excavations). It is likely that some contact

metamorphism and alteration of the Phyllite has occurred near to the contacts and increasing sulphide mineralisation occurs in this zone and can become disseminated through the rock mass. In the planning and design of the Cruachan 1 project it was determined the Phyllite was unsuitable for large scale excavations (low uniaxial compressive stress, prone to weathering, highly jointed, etc) due to the properties of these major rock types and previous experience of tunnelling the Phyllite in the area. This was the main reason for choosing the location of the major underground excavations within the Quarry Intrusion.

Further to these two main rock types the BGS geological mapping information also indicates a series of later dykes crosscut the Phyllite and Quartz-Diorite and would indicate a further stage of intrusion and potential for additional contact metamorphism and mineralisation. These are of similar in mineralogy to the diorite.

The Baseline Geological Mapping report (Halcrow/Scottish Power, 2009) describes a large fault zone, possibly related to the identified Brander fault, which runs NNE-SSW through the cavern complex. The report indicates the fault zone as a series of sub-parallel shear belts of around 30m wide through the north and south walls of the machine hall.

3. Potentially Acid Generating Rock Assessment

The PAG assessment comprised a non-invasive walkover survey underground at Cruachan Power Station within the main access tunnel and machine hall to understand mineralogy within the existing excavation wall rocks. The survey was carried out over two days on Tuesday 14th and 15th December 2021.

All access was controlled by site owner Drax who provided site induction for all personnel and site access permits throughout.

The survey comprised examination of cavern (access tunnel and machine hall) walls at regular spacings by Stantec geologists James Weddle and Danny Fraser. At each location the geologists examined the rock face for mineralogical observations, measurements and photographs as required. Particular spots for XRF analysis at each location were identified and a fresh surface obtained by removing a small hand sample by hammer and chisel.

The in-situ analysis of rock mineralogy was carried out using a NITON portable x-ray fluorescence (XRF) tool operated by sub-contractor Chemostrat. Portable X-ray fluorescence (XRF), or as it is sometimes known Handheld XRF, is a small light weight analytical instrument. This instrument is used as a non-destructive test method to determine the elemental analysis and chemical analysis in situ using an X-ray source.

This work was carried out to provide information on the presence of sulphur a key element common in potentially acid generating rocks in the Cruachan 2 excavations.

Spot survey locations were chosen at 13 locations along the side wall of the access tunnel approximately every 100m (subject to concrete lining and other reinforcement) and at tighter spacings around the geological contact area at approximately ch.795 from the access tunnel portal. Within the machine hall seven locations along the west, north and east walls were chosen; the south wall is obscured due to the control rooms. All locations were on readily accessible points of the exposed bare rock faces at a height of 1.0 to 2.0m above floor level to ensure comfortable access whilst standing on the floor.

Representative pictures of the works being carried out in the access tunnel and the machine hall are given here.

Picture 1 Geology survey being undertaken with the access tunnel.

Picture 2 Geology survey being undertaken with the access tunnel.

4. Testing Locations

All locations were at the discretion of Drax site requirements and subject to local micrositing at the time to accommodate local restrictions and requirements.

Access Tunnel

Using the schematic plan of the Access Tunnel from the Halcrow/Scottish Power, 2009, Geological Baseline Mapping report the overall likely available rock exposures in the access tunnel was determined. There are two main rock types exposed in the access tunnel and other minor intrusive rock types. The aim of the visit is to investigate each of these rock types without showing a preference for any one rock type to meet the broad overview scope of this initial stage visit.

The length of the access tunnel is around 1100m from the portal at ch.0 to the machine hall access.

The boundary of the phyllite / quartz diorite is seen in the access tunnel walls at around ch.795.

There are sections of concrete lining along sections of the access tunnel within phyllite at: ch.0-62, ch.109-129, ch.170-188, ch.313-367, ch.624-653, ch.681-694, ch.723-736 which prevent access to the tunnel wall rock at these locations.

There are sections of shotcrete at: ch.73-80, ch.589-591 which prevent access to the tunnel wall rock at these locations.

There are sections of weld mesh and rock bolts which impede local access but can be worked around.

Nominally a location was tested using the handheld XRF approximately every 100m along the tunnel wall starting at Ch.100 (due to the concrete lined section before that) to ch.780 immediately before the geological contact boundary. This gives eight locations within the phyllite rock type at ch.100, ch.200, ch.300, ch.400, ch.500, ch.600, ch.700, ch.780.

In and around the geological contact area two locations were surveyed within a short distance at Ch. 795 and Ch. 820.

Continuing north of the geological contact zone a further three locations in the quartz diorite rock type were surveyed at ch.900, ch.1000 and ch.1059.

This gives 13 total locations in the access tunnel orientated approximately north – south.

The locations in the access tunnel are shown on figure 2 below.

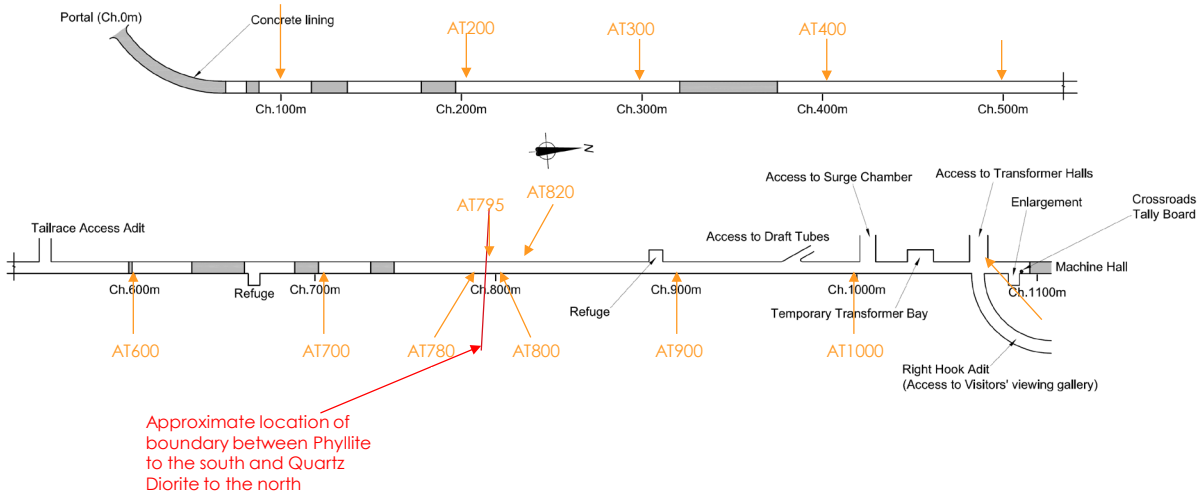

Figure 2 Sketch representation of geology survey locations in Cruachan Access Tunnel (adapted from Cruachan Hydroelectric Power Station Inspection Report, Halcrow/Scottish Power, 2009).

Machine Hall

The machine hall is entirely constructed in quartz diorite rock type.

Access is possible to parts of the west wall, the north wall, and the east wall of the machine hall. The south wall is not accessible being obscured by the offices and the control room.

Access to the north wall is split into 13 'bays' by concrete columns A1 (eastern end) to A14 (western end) and in total is 92m long and so each 'bay is 7m wide minus the column widths. Bays between column A1 and A5 are obscured by loading bay concrete and penstock adit and so the rockface available is around 63m (minus column widths). Three locations were tested along the available north wall rock face at every

3rd bay between column A6 and A13, at approximately 20m spacing between. These spacings are orientated approximately east – west.

The west and east walls are both approximately 24m in length. Two locations were tested on each wall with a spacing of approximately 10m with four locations in total. These spacings are orientated approximately north – south.

The indicative machine hall locations are shown on figure 3 below.

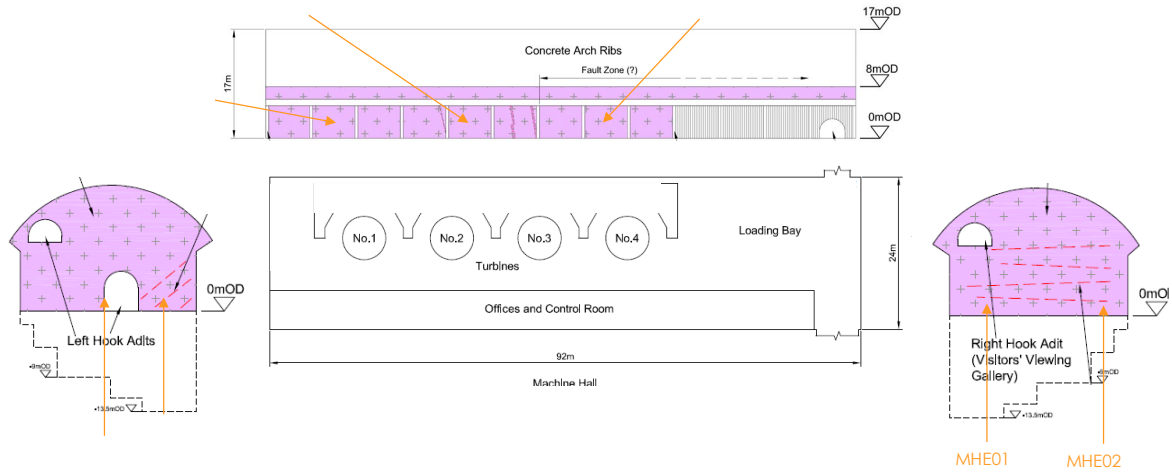

Figure 3 Sketch representation of proposed geology survey locations in Cruachan Machine Hall ((adapted from Cruachan Hydroelectric Power Station Inspection Report – Machine Hall, Halcrow/Scottish Power, 2009).

5. Discussion

Mechanism

Acid Rock Drainage (ARD) describes the formation of acid when sulphide bearing rock spoil from underground excavations (principally pyrite, but also pyrrhotite and chalcopyrite) are exposed to oxidising conditions, typically in the presence of water, due to groundwater, rain and run-off, and air.

When pyrite (FeS_2) is exposed to water and oxygen it can react to form sulphuric acid. This oxidation of pyrite is dependent on the pyrite morphology, oxygen concentrations, pH, bacteria and the presence of acid consuming material. Pyrite oxidation releases Fe^{3+} which has a low solubility and leads to the formation of ferrihydrite ($Fe(OH)_3$) which releases more acid.

The generation of acid from these reactions is known as ARD. ARD can lead to the release of acid dissolved metals, either directly from pyrite or through acid attack on other minerals within the rock.

Oxidation and hydrolysis of other sulphide minerals also may contribute to the generation of ARD. Pyrrhotite ($Fe_{(1-x)}S$ [x = 0 – 0.2]) may also be a source of ARD however pyrite is far more abundant, and its oxidation and breakdown would typically be the main source of acid generation from underground excavation arisings in this area.

Sulphide Mineral Occurrence

Logging of the cavern side walls at the locations of XRF testing shows that pyrite is found either as fine disseminated crystals or rarely as visible blocky crystals up to 4mm. Pyrite is both associated with veins and is also present within the rock mass near contacts in particular.

The visual assessment gives a good indication of the presence of pyrite only. However assessment of ARD from visual assessment is subjective and open to interpretation.

Pyrite within the Phyllite rock mass may be diagenic (i.e. associated with primary rock formation) or orogenic (i.e. associated with heat/pressure alteration in the formation of a mountain belt) and contact metamorphic within the metamorphic aureole (associated with the intrusion of the Quartz Diorite) in origin. The blocky pyrite crystals (up to 4 mm) were primarily found within the rock mass, and these are likely to be diagenetic in origin. XRF results suggest that pyrite concentrations within the rock mass vary however, it is not clear what controls this. It is therefore inferred that pyrite within the rock mass is primarily associated with the original mudstone and siltstone strata of the Phyllite that were deposited in deep, distal, anoxic marine environments. Coarser grained deposits, such as sandstone were likely deposited in shallower environments with more oxygen.

Pyrite along veins around the geological contact area was likely deposited at a later stage associated with hydrothermal fluid circulation within the Phyllite and Quartz Diorite associated with the intrusion of the Quarry Intrusion and contact metamorphism. Pyrite in these areas was noted to be disseminated.

Pyrite within the Quartz Diorite rock mass in the Machine Hall may be associated with the fault zone indicated within the machine hall.

Results

The following table summarises the results of the geological and XRF surveys as described above.

Location	Rock type	Visible Pyrite		XRF Sulphur (PPM)	XRF Sulphur % (>0.3%)	Potentially Acid Generating
AT100	PHYLLITE	No		1541	0.15 (no)	Unlikely
AT200	PHYLLITE	Yes	To 4mm crystals, rare	<limit of detection	<limit of detection	Likely
AT300	PHYLLITE	Yes	To 2mm crystals, rare	2583	0.26 (no)	Likely – due to visible pyrite
AT400	PHYLLITE	Yes	Very fine, rare, disseminated	<limit of detection	<limit of detection	Likely – due to visible pyrite
AT500	PHYLLITE	No		1031	0.10 (no)	Unlikely
AT600	PHYLLITE	No		1363	0.14 (no)	Unlikely
AT700	PHYLLITE	No		3057	0.31 (yes)	Highly Likely
AT780	PHYLLITE	No		1125	0.11 (no)	Unlikely

Location	Rock type	Visible Pyrite		XRF Sulphur (PPM)	XRF Sulphur % (>0.3%)	Potentially Acid Generating
AT795	CONTACT ZONE - QUARTZ-DIORITE	No		<limit of detection	<limit of detection	Unlikely
AT820	CONTACT ZONE - PHYLLITE / QUARTZ-DIORITE	Yes	Hydrogen sulphide odour, yellowish sulphur stained, disseminated fine pyrite	32439	3.24 (yes)	Highly Likely
AT900	QUARTZ-DIORITE	No		6922	0.69 (yes)	Highly Likely
AT1000	QUARTZ-DIORITE	No		1182	0.12 (no)	Unlikely
AT1059	QUARTZ-DIORITE	No		2125	0.21 (no)	Unlikely
MHW2	QUARTZ-DIORITE	No		84340	8.43 (yes)	Highly Likely
MHW1	QUARTZ-DIORITE	No		37010	3.70 (yes)	Highly Likely
MHN1	QUARTZ-DIORITE	No		3390	0.34 (yes)	Highly Likely
MHN2	QUARTZ-DIORITE	No		1902	0.19 (no)	Unlikely
MHN3	QUARTZ-DIORITE	Yes	Very fine, rare, disseminated	1909	0.19 (no)	Likely – due to visible pyrite
MHE1	QUARTZ-DIORITE	Yes	Very fine, rare, disseminated	49374	4.93 (yes)	Highly Likely
MHE2	QUARTZ-DIORITE	Yes	Very fine, rare, disseminated	3526	0.35 (yes)	Highly Likely

Conclusions

This analysis is a preliminary non-intrusive assessment, and its only aim is to provide a geologist's opinion and for scoping any future ARD assessment. Sampling has not been undertaken along the proposed Cruachan 2 tunnel alignment as this initial site visit was undertaken pre ground investigation stage and no sampling was requested as part of this work. Initial logging and in-situ XRF testing of rock exposures within the Cruachan 1 excavations have been undertaken as representative of the likely bedrock that will be encountered along the line of the tunnel and powerhouse excavations.

Based on the site visit and in-situ XRF analysis carried out here, the following conclusions have been drawn:

A brief literature review has been carried out. This indicates that XRF results showing total sulphur >0.3% is indicative of PAG however others indicate values >1.0%. We have used a conservative value of >0.3% in this note.

Based on the visual occurrence of pyrite noted by Stantec coupled with where the XRF results showed total sulphur >0.3% the results generally suggest there is likely potentially acid generating rock at twelve of the twenty locations visited eight of which are highly likely to be PAG. These locations are between ch.700 and ch.900 to the north and south of the geological contact zone in the access tunnel and in the east and west walls of the machine hall and are present in both formations.

Non Acid Generating (NAG) formations were identified at eight locations within Cruachan 1 complex within both rock types however these were largely within the Ardrishaig Phyllite Formation. Visual mapping of outcrop has identified some minerals of neutralising potential, namely calcite largely, however it is not believed at this stage that significant quantities are present to provide neutralisation.

Extrapolating these conclusions to the proposed Cruachan 2 development then it is recommended that the underground excavation works will require a preliminary ARD management plan which can be further developed by the Contractor responsible for the excavation works. This plan should include additional advanced ARD testing and Acid-Based Accounting (ABA) and geological mapping to better define the likely environmental hazard and risk. Testing will likely comprise detailed ARD leach tests and X-Ray Diffraction (XRD) AND XRF analysis of recovered rock core, drill cutting and hand specimen samples to define the mineral percentages within the Cruachan 2 excavation rock spoil. In particular sections of the proposed underground excavations in the vicinity of the geological contact zone and fault/shear zones should be given careful consideration.

This assessment should also be accompanied by surface mapping at outcrop to develop the geological ground model and additional petrographic and geochemical analysis using XRF and XRD. Such mapping should include any surface infrastructure planned as part of the scheme where significant rock excavation is to be undertaken.

The ARD management plan should consider how PAG materials are tested and segregated during the drilling and blasting and other methods of rock excavation both underground and at surface within the site. The management plan should also define appropriate waste sites and temporary storage and transportation of materials identified as PAG aligned with the appropriate legislation and international guidance.

Further investigations should be planned such that they also evaluate appropriate material reuse geotechnically as fill materials and also as concrete aggregates.

Appendix 1 – Chemostrat XRF Results

DOCUMENT ISSUE RECORD

Technical Note No	Rev	Date	Prepared	Checked	Reviewed (Discipline Lead)	Approved (Project Director)
331201086/01/TM/ARD	00	21/01/22	DF	JW	JW	
Minor error in conclusion amended	01	17/06/22	DF	JW		

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Access Tunnel		HHXRF (%)									
Location	Sample No.	Al2O3	SiO2	TiO2	Fe2O3	MnO	MgO	CaO	K2O	P2O5	
AT100	sample 1	1.87	20.27	0.22	5.79	0.05	<lod	6.78	0.32	0.05	
AT200	sample 2A	4.96	33.44	0.25	8.02	0.10	<lod	14.59	0.42	0.07	
AT200	sample 2B	0.81	7.84	0.23	6.83	0.12	<lod	11.63	0.82	<lod	
AT300	sample 3A	1.13	11.55	0.29	17.12	0.12	<lod	6.57	0.56	<lod	
AT300	sample 3B	<lod	3.27	0.18	5.49	0.22	<lod	2.67	0.35	<lod	
AT300	sample 3C	2.30	28.54	0.34	3.36	0.02	1.21	1.49	1.35	<lod	
AT300	sample 3D	0.45	8.23	0.80	8.96	0.06	<lod	3.94	0.31	0.09	
AT400	sample 4	2.32	26.29	0.24	3.43	0.05	<lod	21.26	0.79	<lod	
AT500	sample 5	1.23	10.23	0.27	6.21	0.04	<lod	14.78	0.89	0.03	
AT600	sample 6A	1.91	14.08	0.37	3.32	0.02	<lod	24.36	1.16	0.04	
AT600	sample 6B	1.09	8.48	2.31	17.32	0.08	<lod	4.18	0.31	0.15	
AT700	sample 7	4.53	23.83	0.28	6.42	0.04	1.67	7.57	2.61	<lod	
AT780	sample 8	4.51	25.52	0.14	7.88	0.21	1.29	17.18	0.10	<lod	
AT795	sample 9	1.82	14.08	0.82	8.87	0.07	<lod	4.57	0.60	0.12	
AT820	sample 10A	1.82	13.22	0.14	2.16	<lod	<lod	15.36	0.50	<lod	
AT820	sample 10B	2.46	14.57	0.67	20.79	0.11	<lod	3.71	0.72	0.08	
AT820	sample 10C	4.52	28.11	0.64	6.92	0.06	<lod	7.82	0.79	0.13	
AT820	sample 10D	6.37	42.89	0.81	8.61	0.08	1.72	5.38	1.02	0.29	
AT900	sample 11	1.23	10.32	0.64	7.24	0.07	<lod	4.97	0.76	0.11	
AT1000	sample 12	2.87	19.53	0.52	5.64	0.05	<lod	3.15	0.76	0.11	
AT1059	sample 13	11.06	47.57	0.36	3.89	0.03	<lod	6.60	0.78	0.29	
Machine Hall											
Location	**Sample No.**										
MH-W2	sample 14	3.35	22.44	0.25	2.86	0.05	<lod	13.87	0.86	0.10	
MH-W1	sample 15	10.17	54.82	0.65	4.57	0.07	1.71	7.28	3.05	0.17	
MH-N1	sample 16	5.57	36.24	0.39	2.72	0.03	2.78	5.51	0.88	0.27	
MH-N2	sample 17	7.83	41.78	0.50	6.80	0.07	1.30	5.31	1.09	0.28	
MH-N3	sample 18	5.67	32.82	0.44	9.34	0.08	3.56	2.81	0.42	0.10	
MH-E1	sample 19	1.32	11.47	0.33	4.96	0.03	<lod	14.37	0.37	0.12	
MH-E2	sample 20	1.30	12.36	0.37	4.85	0.06	<lod	4.22	0.63	0.06	

Access Tunnel		HHXRF														
		ppm														
Location	Sample No.	Cl	As	Ba	Cr	Cu	Nb	Pb	Rb	Sr	Th	U	V	Zn	Zr	S_Raw
AT100	sample 1	<lod	<lod	190	54	<lod	8	<lod	13	337	<lod	5	60	74	188	1541
AT200	sample 2A	7832	<lod	263	52	118	<lod	<lod	22	431	7	<lod	100	42	161	<lod
AT200	sample 2B	<lod	<lod	455	35	<lod	<lod	<lod	31	636	<lod	7	69	62	66	<lod
AT300	sample 3A	139	<lod	278	133	<lod	6	<lod	11	436	13	6	108	120	176	410
AT300	sample 3B	<lod	20	157	43	<lod	<lod	57	23	165	<lod	<lod	43	285	71	416
AT300	sample 3C	77	8	403	32	42	9	36	51	369	<lod	<lod	106	245	208	8061
AT300	sample 3D	<lod	23	186	63	353	21	<lod	13	624	<lod	<lod	123	107	360	1447
AT400	sample 4	<lod	<lod	336	54	<lod	6	<lod	47	395	<lod	<lod	<lod	45	108	<lod
AT500	sample 5	<lod	<lod	297	42	<lod	10	<lod	81	629	7	6	52	140	142	1031
AT600	sample 6A	<lod	<lod	197	<lod	<lod	9	<lod	39	333	10	<lod	31	70	118	<lod
AT600	sample 6B	<lod	16	341	86	58	27	<lod	15	496	<lod	25	305	94	399	1363
AT700	sample 7	<lod	<lod	619	47	224	12	<lod	142	779	14	<lod	45	85	194	3057
AT780	sample 8	<lod	85	283	71	<lod	7	<lod	10	328	7	<lod	51	40	292	<lod
AT795	sample 9	<lod	<lod	530	80	<lod	<lod	<lod	25	1184	<lod	7	134	75	129	1125
AT820	sample 10A	<lod	<lod	837	44	92	<lod	155	21	1127	<lod	<lod	24	53	49	97359
AT820	sample 10B	<lod	<lod	615	110	779	11	<lod	37	607	<lod	<lod	144	89	252	24584
AT820	sample 10C	<lod	<lod	629	57	<lod	<lod	<lod	36	774	<lod	<lod	78	57	176	6807
AT820	sample 10D	153	<lod	718	87	57	4	<lod	30	950	<lod	6	122	96	109	1007
AT900	sample 11	<lod	<lod	715	43	<lod	<lod	<lod	26	924	<lod	<lod	67	90	89	6922
AT1000	sample 12	81	<lod	579	52	<lod	<lod	<lod	28	1245	<lod	<lod	75	58	86	1182
AT1059	sample 13	519	<lod	626	48	<lod	<lod	<lod	15	1624	<lod	<lod	60	25	40	2125
Machine Hall																
Location	**Sample No.**															
MH-W2	sample 14	253	<lod	615	88	59	6	<lod	50	1033	<lod	<lod	39	260	176	84340
MH-W1	sample 15	323	<lod	1307	57	40	<lod	13	69	918	8	5	60	108	249	37010
MH-N1	sample 16	576	<lod	778	56	352	<lod	<lod	30	1077	<lod	<lod	67	39	63	3390
MH-N2	sample 17	315	<lod	666	46	<lod	<lod	<lod	35	1081	<lod	<lod	69	76	93	1902
MH-N3	sample 18	62	<lod	184	57	<lod	<lod	<lod	16	213	<lod	<lod	95	68	102	1909
MH-E1	sample 19	567	<lod	755	55	85	<lod	<lod	32	1168	<lod	6	65	45	45	49374
MH-E2	sample 20	431	<lod	722	22	<lod	<lod	<lod	21	1460	<lod	<lod	31	61	56	3526

Further Environmental Information

Appendix 2 Cultural Heritage

Cultural Heritage
EIA Report Addendum

ECU00004492 Cruachan Expansion Project

December 2022

Cultural Heritage
EIA Report Addendum

Cruachan Expansion Project

Project Ref:	34287/A5/P1/LK	34287/A5/P1/LK	34287/A5/P1/LK
Status:	Draft	Draft	Final
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Prepared by:	LK	LK	LK
Checked by:	ES / LF		LF
Authorised by:	GW		LF

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APPENDICES

1.0 INTRODUCTION

1.1 Barton Willmore, now Stantec has prepared this addendum on behalf of Drax Cruachan Expansion Limited ('the Applicant') for the proposed 'Cruachan Expansion Project' (the 'Proposed Development'). This Environmental Impact Assessment Report (EIAR) Addendum has been prepared to address comments received by Historic Environment Scotland (**Appendix 1**) in relation to built heritage considerations for the application for consent under section 36 of the Electricity Act 1989 (ECU Reference ECU00004492).

1.2 The Proposed Development will be located on land around and to the east of the existing Cruachan pumped storage hydro power station (Cruachan 1) on the northern banks of Loch Awe in Argyll and Bute. The 'Site' location and context is as described in Section 1.3 and Figure 1.1 of the previously submitted EIA Report.

1.3 This addendum sets out the heritage significance of the designated heritage assets identified at paragraph 3.4, along with any contribution made by their setting. It then goes on to consider the potential impacts of development within the legislative and policy context. This report should be read in conjunction with the previous Cultural Heritage EIAR Chapter 12, dated May 2022.

2.0 POLICY CONTEXT

National Planning Policy

2.1 Paragraph 3.30 of Scotland's Third National Planning Framework, 2014 (NPF3)[i] acknowledges that hydroelectric power is a "key asset in the north of Scotland" and that "…increasing the capacity of pumped storage hydroelectricity can complement our ambitions for more renewable energy capacity. Amongst the most advanced plans for this, and one which builds on an existing asset, are the proposals to increase capacity at Cruachan. We have identified new and expanded pumped storage facilities, including Cruachan, as a national development." Paragraph 4.6 notes that "The historic environment is an integral part of our well-being and cultural identity."

2.2 Revised Draft National Planning Framework 4 (NPF4) was laid before the Scottish Parliament on 8th November 2022. Pumped Hydro Storage continues to be recognised as a National Development in Revised Draft NPF4 which will supersede NPF3 when approved by the Local Government Housing and Planning Committee. Cruachan is singled out as a "nationally important example of a pumped storage facility with significant potential for enhanced capacity that could create significant jobs in a rural location".

2.3 Paragraphs 135-151 of the Scottish Planning Policy (SSP)[ii] deals with conserving and enhancing the historic environment and sets out Government planning policy. The policy statement recognises the importance of preserving designated and non-designated assets and how they contribute to a "sense of place, cultural identity, social well-being and economic growth." It also notes that in order to enable positive change to heritage, this should be informed by a "…clear understanding of the importance of the heritage assets."

Local Planning Policy

2.4 The Development Plan Framework for Argyll and Bute comprises the Local Development Plan[iii]. The policies set out in the original EIAR Chapter 12 relate to both archaeology and built heritage. Those policies relevant to the built heritage assessment are:

- Policy LDP 3 – Supporting the Protection, Conservation and Enhancement of our Environment.
- SG LDP ENV 16(a) Development Impact on Listed Buildings.

2.5 The emerging Argyll and Bute Proposed Local Development Plan 2[iv] is also a material consideration in decision-making. Emerging Policies 15-21 are relevant to this assessment.

Legislative Context

Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997[v]

2.6 Listed buildings are afforded statutory protection under the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997. Sections 14 and 59 require that local planning authorities have special regard to the desirability of preserving the heritage significance of listed buildings and their setting when determining listed building consent and planning applications, respectively.

Best Practice Guidance

2.7 Historic Environment Policy for Scotland (HEPS)[vi], 2019 is a material consideration in the planning process. This document sets out the considerations that need to be taken into account when proposals affect the historic environment. HEPS "sets out a series of principles and policies for the recognition, care and sustainable management of the historic environment."

2.8 Historic Environment Scotland has published a series of guidance documents which are intended to guide changes to the historic environment including:

- Managing Change in the Historic Environment: Engineering Structures (2020)[vii]
- Managing Change in the Historic Environment: Use and Adaptation of Listed Buildings (2020)[viii]
- Managing Change in the Historic Environment: Setting (2020)[ix]

3.0 ASSESSMENT METHODOLOGY

3.1 There are no published guidelines outlining a general methodology for the preparation of the assessment of likely significant effects on built heritage from a proposed development under the EIA Regulations. The International Council on Monuments and Sites (ICOMOS) issued guidance on Heritage Impact Assessments for Cultural World Heritage Properties (2011)[x]. Although specifically addressing World Heritage Sites and development impacts on their Outstanding Universal Value, the document provides a useful approach to the assessment and evaluation of impacts. IEMA's Principles of Cultural Heritage Impact Assessment (2021)[xi] has also informed this assessment.

3.2 The assessment methodology has been guided by various published documents including:

- Historic Environment Scotland *Managing Change in the Historic Environment: Engineering Structures* (2020)
- Historic Environment Scotland *Managing Change in the Historic Environment: Use and Adaptation of Listed Buildings* (2020)
- Historic Environment Scotland *Managing Change in the Historic Environment: Setting* (2020)
- ICOMOS' *Guidance on Heritage Impact Assessments for Cultural World Heritage Properties* (2011); and
- IEMA's *Principles of Cultural Heritage Impact Assessment* (2021).

3.3 For the purposes of this EIAR Addendum, standard EIA terminology has been used in place of the SPP and NPF3 terminology. The term 'heritage receptor' is therefore used in lieu of 'heritage asset' and 'sensitivity' in lieu of 'interest.'

3.4 A desk-based review identified several heritage receptors with potential to be impacted by the proposed development. As agreed through discussions with the local planning authority (LPA), Argyll & Bute Council ('ABC') and Historic Environment Scotland ('HES') (Site visit notes enclosed at **Appendix 2**), this assessment is focussed on the following heritage receptors:

- Ben Cruachan Hydro Electric Scheme, Turbine Hall – Category A listed
- Falls of Cruachan Railway Viaduct – Category A listed
- Ben Cruachan Hydro Electric Scheme, Cruachan Dam – Category B listed

3.5 The scope of this assessment does not consider the archaeological potential of the Site. This is considered in the previously prepared Cultural Heritage ES Chapter 12. The

assessment of significance follows the heritage interest-led approach set out in the Historic Environment Policy for Scotland (HEPS), comprising aesthetic, historic, scientific, and social values. This has been guided by the definitions provided in the 'BURRA Charter: Charter for Places of Cultural Significance' (2013)[xii]. The assessment of the contribution made by the setting of the heritage assets follows the staged assessment approach set out in Historic Environment Scotland's guidance document 'Managing Change in the Historic Environment: Setting' (2016).

3.6 This addendum assesses the potential for likely significant effects from the construction, operational and decommissioning phases of the development on built heritage receptors. The assessment includes the following stages.

- Identification of the baseline conditions and level of sensitivity of built heritage receptors.
- Appraisal of the magnitude of impact arising from the construction, operational and decommissioning phases of the development and the significance of effects on those identified receptors, prior to the implementation of any mitigation measures.
- Identification of mitigation to avoid or minimise significant adverse effects, where possible, in a way that meets the requirement of the *Town and Country Planning (Environmental Impact Assessment) Regulations 2017* (as amended) (the EIA Regulations).
- Assessment of the likely significant effects of the construction, operational and decommissioning phases of the Development, taking into consideration any mitigation measures proposed to identify the residual effects.

3.7 The sensitivity of a built heritage receptor has been determined based on its designation and desk-based research to inform a professional judgement in relation to its heritage interest, accounting for the likely nature, date, extent, survival, condition, rarity, and group value of the heritage asset. Assessing the magnitude of impact is similarly an exercise of professional judgement, applying an understanding of the impacts of the development on the sensitivity of the receptors established in the baseline condition.

Sensitivity Criteria

3.8 The significance of effect thresholds for built heritage receptors is determined by considering the sensitivity of heritage receptors alongside the magnitude of impact that will be experienced. The criteria for establishing the sensitivity of built heritage receptors

are presented in Table 1 below.

Table 1: Criteria for Establishing Sensitivity of Heritage Receptors (from original Cultural Heritage Chapter 12).

Sensitivity	Criteria for Establishing Sensitivity
High	• Remains of inscribed international importance, such as World Heritage Sites, • Category A Listed Buildings, • Gardens and Designed Landscapes, • Scheduled Monuments, • Registered battlefields, and • Conservation areas containing very important buildings.
Medium	• Category B and C Listed Buildings, • Conservation Areas, and • Undesignated buildings, monuments, sites, or landscapes that can be demonstrated to have heritage value, equivalent to the designation criteria.
Low	• Locally listed buildings as recorded on a local authority list, and • Undesignated buildings, monuments, sites, or landscapes that can be demonstrated to have heritage value equivalent to the local listing criteria.

Magnitude of Impact

3.9 An impact can be characterised in terms of timing, scale, duration, and reversibility. These can be described as short, medium, or long-term, permanent, or temporary and can be positive or negative.

3.10 A direct impact on a heritage asset is likely to result from changes to the physical fabric of the asset. An indirect impact is likely to result from changes to the asset's setting.

3.11 In considering the potential magnitude of an impact, a professional judgement has been made about the receptor's susceptibility to change as a result of the Proposed Development. Table 2 below sets out criteria which have been used to determine the magnitude of an impact, which can vary from 'substantial' to 'negligible'.

Table 2: Magnitude of Impact on Built Heritage Receptors (adapted from ICOMOS 2011).

Magnitude of Impact	Criteria for Assessing the Magnitude of Impact
Substantial	• Change to the receptor, such that it is totally altered or destroyed. Comprehensive change to the setting.
Major	• Change to the receptor, such that it is significantly modified. Change to the setting such that it is significantly modified.
Moderate	• Change to the receptor, such that the asset is slightly different. Change to the setting.
Minor	• Very little change to the fabric or setting that would materially harm significance, approximating to a 'no change' situation
Negligible	• No change to fabric or setting that would harm significance.

Significance of Effect

3.12 The assessment to determine the significance of the effect utilises a matrix that considers the sensitivity of the receptor against the magnitude of the impact from the Proposed Development, as set out in Table 3 below. For the purposes of this assessment, the significance of effect has been determined by the interaction of the receptor's sensitivity to change and the magnitude of change (impact). Effects that are graded as Moderate or above are considered 'significant' with respect to the EIA Regulations. Effects can be adverse, beneficial, or neutral.

Table 3: Effect Significance Matrix

		Magnitude of Impact				
		Negligible	**Minor**	**Moderate**	**Major**	**Substantial**
Sensitivity	**High**	Negligible	Moderate / Minor	Major	Substantial / Major	Substantial
	Medium	Negligible	Minor	Moderate / Minor	Moderate	Major
	Low	Negligible	Negligible	Minor	Moderate / Minor	Major / Moderate

4.0 CURRENT BASELINE

Sensitivity of Built Heritage Receptors

Ben Cruachan Hydro Electric Scheme, Turbine Hall

4.1 As a Category A listed building, the Turbine Hall is a receptor of **high sensitivity.** Its significance is derived primarily from its aesthetic and scientific value, arising from its innovative technological engineered design. The designation describes the receptor as:

"…a monumental engineering achievement and an integral part of one of Britain's most innovative hydro-electric power schemes and the first example of the use of reversible turbine pumped storage technology."

4.2 The Turbine Hall is of high historic cultural significance for the role it played in the technological development of hydroelectric power and the post-war energy programme of Scotland. In 1965, when construction was completed, the asset was the first example of a reversible turbine pumped storage plant in Britain. This development was significant for British power generation as it improved energy efficiency; with the power station being able to store otherwise wasted energy produced in off-peak hours to instead be used when it was most needed. The construction of a power station of this scale, underground, and utilising pumped storage was 'pioneering' and paved the way for similar schemes elsewhere in the world. The hall was designed by James Williamson and Partners and is noted in the listing as being 'typical of their approach' which was defined as being innovative and forward thinking. Williamson and Partners became synonymous with the North of Scotland Hydro Electric Board (NoSHEB).

4.3 The scale of the Turbine Hall and its functional character allows for an appreciation of the technological achievement of its construction. The structure comprises the main turbine hall and access tunnel, at the point where the access tunnel meets the turbine hall, there are several secondary tunnels, adits, and shafts, including the 'viewing gallery, transformer hall and surge shaft.' In discussions with HES and ABC, it has been indicated that the designation includes the main access tunnel.

4.4 The Turbine Hall is large in scale and is barrel vaulted with areas lined with concrete. A large industrial gantry runs west to east along the hall and 1960s rectangular lighting hangs from the ceiling. The south side of the hall has exposed bedrock walls and the four generators sit at the centre of the hall which has a later tiled floor.

4.5 The receptor holds high architectural significance for its distinctive 1960s interior design, featuring a timber mural by the artist Elizabeth Falconer. The turbine hall is 36m high by 90m long and features several design features dating from the 1960s, including the timber mural, lighting and use of timber and concrete throughout. The designation (**Appendix 3**) notes the following features specifically:

- Viewing gallery to NE corner,
- Concrete lined vaulted roof,
- Supported track and gantry cranes,
- Tiled Floor
- Timber mural by Elizabeth Falconer,
- Timber panels and acoustic baffling panels of concrete, geometric shapes,
- Projecting window to control room,
- Large overhead lighting panels.

4.6 The south wall of the hall has the highest architectural and artistic cultural significance, with a multitude of 1960s period design features. Wooden panelling and geometric concrete baffling panels line the face of the south wall. A timber and glass control room projects over the four generators on the upper level. Along the lower level are display panels for each of the turbine units which date to the 1980s, the internal workings having been replaced over time. Elizabeth Falconer's wooden mural sits on the south wall near the west end. The mural depicts the local legend *Cailleach Bheur* (the Old Hag of The Ridges), and refences the construction of the dam (with the fifteen shrouded figures referencing the fifteen lives lost in construction). These features contribute to create an attractive and significant interior with strong mid-20th century designs and imaginative uses of materials.

Setting

4.7 The asset is located c.400m below the ground level of Cruachan Dam and is accessed by a 1km long tunnel located on the northern shoreline of Loch Awe, this setting makes a positive contribution to the asset's significance. Access to the turbine hall is through the main access tunnel, which then opens up to the monumental interior of the turbine hall. The length of the tunnel and the contrast in scale between it and the turbine hall amplifies the scale of the asset. The fact that the asset is set underground enhances the experience, allowing for an appreciation of the engineering achievement accomplished in its construction.

4.8 The wider setting of the asset is within the hillside of Ben Cruachan, to the north and west of *Loch Awe*. As most of the asset is underground its landscape setting makes a

limited contribution to its heritage interest. To the north of the asset is the reservoir and dam associated with the power plant. These are intimately connected with the function of the asset and contribute positively to its significance. To the east and west are the mountain slopes of Ben Cruachan, which create an attractive natural setting to the listed building. To the south is the A85 and Loch Awe. These features all form part of the wider setting of the asset; however, they make a limited contribution to its heritage interest.

Ben Cruachan Hydro Electric Scheme, Cruachan Dam

4.9 The listed dam forms part of the group of assets associated with the Cruachan Hydro Electric Power Station. As a Category B listed building, it is of **medium sensitivity** and its significance is derived primarily from its historic and architectural interest as a significant engineered intervention which formed part of the development of hydroelectrical power in the mid-20th century. The architectural interest of the dam is enhanced by its industrial form and immense scale. Constructed of a mix of massed and reinforced concrete with metal fencing, the dam features prominent sloped arcaded buttresses. The central buttress is larger in size and contains the pipes and control gates for the hydroelectric station. The functionality and scale of its design ensures that the dam is a prominent feature within the landscape.

Setting

4.10 The immediate setting of the dam makes a positive contribution to its heritage significance, creating a highly attractive natural setting, comprising of the reservoir which feeds the power station below. The landscape surrounding the dam includes the mountains of Meall Cuanail to the west and Beinn a Bhuiridh to the east. The dam appears as a manmade intervention within an otherwise scenic backdrop. The wider setting of the asset is largely similar to its immediate setting; there is a lack of development, and the area is largely natural. The dam sits within the Ben Cruachan mountain range. The peaks of the mountain range create a horseshoe around the dam with the valley sloping southwards to *Loch Awe*.

4.11 The valley south of the asset contains some surface features associated with the power station, such as a road and electrical substation. However, the smaller scale of these features in the larger setting mean that it does not detract from the experience of the asset. The weathered concrete exterior of the asset is complimented by the exposed rock of the mountain, improving the ability for one to appreciate its architectural form. There is an attractive contrast between the isolated and natural setting of the asset and its industrial architectural form, this stark contrast enhances the experience of the asset and positively contributes to its significance.

Falls of Cruachan Railway Viaduct

4.12 As a Category A listed building, the viaduct, is a receptor of **high sensitivity**. The significance of the receptor is derived from its architectural and historic interest, as a result of its innovative form and its role in improving rail connections with Argyll. The viaduct is the first on a British railway to have arches made from mass concrete, an innovation which would greatly improve the ability of 19th century engineers to create long stretches of viaducts. The viaduct forms part of the Callander and Oban Railway which, constructed between 1866 and 1880, greatly improved connections into Argyll and brought significant benefits to the previously isolated western region.

4.13 The viaduct is also a fine example of 19th century rail infrastructure, described in the designation as comprising of three concrete arches sitting upon bull-face stone piers. The top of the viaduct has a crenelated parapet and a 21st century safety rail. There is a string course along the base of the parapet and the central crenelation is raised with a crest of arms. It forms a group with the nearby Cruachan Dam and Turbine Hall as part of a series of large-scale interventions into the surrounding landscape.

Setting

4.14 The viaduct is located to the north of the A85 and spans across a stream running down the southern slopes of Ben Cruachan. The railway line sits within a small area of wooded landscape at the foot of the mountain. The surrounding area makes a positive contribution to the setting, with the surrounding natural scenery creating an attractive backdrop. To the south of the asset is the A85, the potentially negative impact of the road is largely mitigated by intervening vegetation, blocking views and noise even in winter, and its position lower down the mountain.

4.15 The wider setting of the asset is defined by its mountainous character, with Ben Cruachan in particular providing the backdrop in which the asset is experienced. The nature of the surrounding landscape further strengthens the appreciation of the viaduct as a feat of engineering achievement. To the southeast of the asset are the buildings associated with the nearby power station; the two-storey office building; and Visitor Centre. As a result of existing topography, only the upper floor of the office building is visible when travelling along the A85. These buildings are of varying architectural forms and have no functional or associative relationship with the listed building and make no contribution to its significance.

5.0 LIKELY SIGNIFICANT EFFECTS

5.1 This section assesses the likely significant effects of the Proposed Development in relation to those receptors that may be directly or indirectly affected. Construction and operational phase effects are considered separately for each of the receptors identified above.

Embedded Mitigation

5.2 For detailed plans relating to the Section 36 application, please refer to the original submission documents. Details of embedded mitigation are set out in detail within the EIAR Cultural Heritage Chapter 12. In summary, these include:

- Landscape design to the proposed upper intake,
- The preparation of a Construction Environmental Management Plan (CEMP), a draft of which was included in the original EIAR.

5.3 The following drawings and visuals are also enclosed at **Appendix 4**:

- **Location Plan**
  - 331201086/001/C/01/Rev A (**Figure 1**)
- **Access Tunnels connecting Powerhouse and MAT**
  - 331201086/001/C/0200, 331201086/001/C/0201, and 331201086/001/C/0202 (**Figures 2-4**)
- **Quayside**
  - Figure 11.7d – Visualisation of Proposed Quayside Structure from above Tervine: Photomontage (10 Years After Completion) (**Figure 5**)
- **Upper Intake**
  - 331201086/ (**Figure 6**)
  - 11.8d: Visualisation of Proposed Upper Intake Structure from Cruachan Reservoir Track: Photomontage (10 Years After Completion) (**Figure 7**)

5.4 Following receipt of comments from HES and a site visit on 6 September 2022, further detail has been provided in the following documents, enclosed at **Appendix 5.**

- Cruachan 2 – Upper Intake and Dam Memorandum, Nov 2022
- Cruachan 2 – Access Tunnels connecting Powerhouse and MAT Memorandum, Nov 2022

5.5 A separate Listed Building Consent application is to be submitted for creation of the two new access tunnels and the associated works that directly impact the listed Turbine Hall.

Assessment of Likely Effects

Ben Cruachan Hydro Electric Station, Turbine Hall

Construction Phase

5.6 The development proposals seek to expand the power station at Cruachan and involves the creation of a series of new tunnels and shafts including a new turbine hall to the east of the existing power station. The proposed works will sit roughly parallel to the original structure within the mountain, with a new access tunnel between the two. The proposal also includes the creation of a new quayside, immediately adjacent to the existing access tunnel on the shore of Loch Awe (**Figure 1 –** Drawing No. 331201086/001/C/01 Rev A).

Creation of connecting access tunnels

5.7 Within the existing turbine hall, the new access tunnel linking the existing and proposed power stations will be located on the north-eastern elevation, below existing visitors viewing gallery and will measure approximately 3.5m x 3.5m in size. Within the existing access tunnel, the proposed opening will be located at approximately 775m from the entrance into the tunnel, on the eastern elevation and will measure 4.5m x 4.5m in size. These new access points are necessary to allow access and movement for plant, machinery, and personnel between the two parts of the power stations (see **Figure 1** for proposed locations of new adjoining tunnels).

5.8 The construction of the tunnels will be phased, from pre-construction investigation to the blasting works required. The proposed stages are set out below and further detail is provided in the proposed plans (**Figures 2 – 4**) and Cruachan 2 – Access Tunnels connecting Powerhouse and MAT Memorandum (**Appendix 5**).

- **Stage 1:** Installation of the Box Structure enclosure with ventilation duct at face of proposed tunnel entrance.
- **Stage 2:** Drilling and Installation of Temporary Rope Anchors, fully grouted-post tensioned rock bolts, and drilling for the pilot tunnel.
- **Stage 3:** Blast Charging of Pilot Tunnel drill holes, installation of blasting mat, closing of the enclosure door, and undertaking blasting.
- **Stage 4:** Ventilation for the blast smoke/dust, open enclosure door and remove blasting mat, mucking-off the rock spoil, and drilling holes for the tunnel

enlargement.

- **Stage 5:** Blast Charging of the enlarged drill holes, installation of blasting mat, closing of the enclosure door, and undertaking blasting.
- **Stage 6:** Ventilation for the blast smoke/dust, open enclosure door and remove blasting mat, mucking-off the rock spoil, installation of rock supports and steel ribs.

5.9 The construction of the new tunnels will require the removal of existing rock face, through targeted blasting. During construction, a temporary box enclosure will be installed within the two areas which will serve to protect the existing power station. These enclosure structures will form a barrier which will be designed in such a way as to prevent any damage to surrounding structure and will include a ventilation system.

5.10 The installation of box structure enclosures at the entrance to both tunnels would involve the use of anchor bolts within the rock phase and the floor covering. Following completion of the works, the box enclosures will be removed, and the flooring made good. Details of the proposed construction is shown on Drawing No.331201086/001/C/0200 Rev A (**Figure 2**).

5.11 The new tunnel openings are likely to be constructed from east to west, starting in the new turbine hall and access tunnel. During construction, the bedrock above would be supported, this is particularly important when the proposed tunnel passes underneath the existing viewing gallery. In this area, the design and size of the tunnel has been reduced in order to provide a thicker rock ledge between the viewing gallery and the crown of the proposed tunnel, to ensure that the structure is not undermined.

5.12 Stage 2 includes the drilling of rope anchors and installation of rock bolts, as well as the drilling for the pilot tunnel. Details are provided in Drawing No.331201086/001/C/0200 Rev A (**Figure 2**). Following completion of the works, the excavated faces of the tunnels will be supported by rock bolts, rock anchors, shotcrete, and steel ribs to mitigate the risk of rockfalls during construction or instability. The length and spacing of the rock bolts, rock anchors, and supporting steel ribs will be designed by suitably experienced engineering geologists in the field in response to the encountered ground conditions from a standardised typical design. This approach is in line with previous tunnel construction and is necessary to ensure the continued stabilisation of the rock.

5.13 The next stage of construction involves the blasting of the proposed tunnels. This is done in two stages; first the pilot tunnel is created, and then further blasting is undertaken to expand the opening to the full height and width, both methods are the same (Stage 3 and 4, 5 and 6). Following the charging of the holes the blasting mats will be installed, utilising

the rope anchors and the door to the box enclosure closed. This will create a sealed environment in which blasting can occur and will ensure that no blasting material, dust, or vibrations will impact the existing structure or machinery. Details of these stages is shown in detail on Drawing No. 331201086/001/C/0201 Rev A (**Figure 3**).

5.14 Due to the sensitive nature of the turbines themselves, it is critical for the turbine hall not to experience any vibration or dust as a result of the construction work. It is key to the proposed mitigation strategy that during construction works the controls proposed will prevent any damage to the turbine units. As set out in the Memorandum, in order to limit blast-induced vibrations, *"…the access tunnel will be excavated in short segments and by excavating the pilot tunnels. The pilot tunnel excavation will be followed by expanding the segment to full access tunnel size. The subsequent segments will be excavated upon installation of the rock supports for the preceding segment. A blast monitoring will be undertaken by the contractor at critical infrastructure in order to ensure that the peak particle velocity does not exceed thresholds established by the owner's engineer".*

5.15 The protection methods detailed in the accompanying plans and staged approach above, will ensure that there will be no measurable vibrations and the internal features of the turbine hall, including the turbines and generators, the mural and control panels, will be unaffected by the proposed development.

5.16 The construction of the new tunnel openings with the existing structure will result in temporary changes, which would have a minor adverse impact on the character and appearance of the listed building during the construction period.

Creation of new quayside

5.17 As part of the scheme, a new quayside is proposed, which will facilitate the construction of the underground access tunnels, lower gateworks, and new turbine hall, as shown on the visualisation at **Figure 5**). This will primarily be constructed using excavated material from the new main access tunnel. The proposed quay will measure approximately 12m in depth, 30m in width, and up to 510m in length. This element of the proposal during construction, would also include the temporary storage of spoil prior to its removal off site, and would also include canopy structures which would be enclosed on three sides to prevent silt from stockpiles mobilised by wind/rainfall from entering Loch Awe and the surrounding landscape.

5.18 The proposed quayside will be located below the existing embankment to the loch side. The new quayside is located to the east of the existing infrastructure and the entrance to

the existing access tunnel. Whilst some small trees and shrubs will be removed to facilitate its construction, as a result of the topography and intervening features, the quayside will in the most part be screened from the entrance to the main access tunnel. The construction of the quayside will result in a temporary change to the setting of the listed building which is considered negligible and would result in no change to its cultural significance.

Construction of new upper intake

5.19 The proposals also include the creation of a new upper intake, to the south-east edge of the reservoir, approximately 110m north of the dam. During construction, it is proposed to construct the intake within a temporary dry well and the rock cutting will be undertaken using a combination of blasting and rock support. Given the nature of the construction works combined with the physical and visual separation from the listed Turbine Hall it is considered that this element of the proposal would result in a neutral impact to the setting of the listed building and would not result in any impact to its heritage significance.

Summary

5.20 As set out above and detailed in the Access Tunnels and MAT Memorandum, the works required to facilitate the construction of the new access tunnels between the existing Powerhouse and the new Powerhouse to the east, will result in the removal of a significant amount of rock, whilst ensuring that the existing structure, features, and plant are protected throughout.

5.21 During the construction phase, the proposed works will result in a temporary minor adverse impact on the Category A listed Turbine Hall through the construction of the new powerhouse and associated tunnels and pipework. The principal impact on the receptor will arise from the construction activity associated with the two connecting tunnels within the access tunnel and main hall. This minor impact on a receptor of high sensitivity will result in a **minor adverse** significance of effect.

Operational Phase

Creation of connecting access tunnels

5.22 The creation of two new openings within the existing structure will be a permanent change to the appearance of the listed Turbine Hall and main access tunnel. However, when considered in the context of the functionality of the overall design, alongside the existing tunnels and entrance points within the structure, the new openings are considered to be

an appropriate intervention within the fabric of the historic structure.

5.23 The proposals will not result in the loss of any of the key elements of design or significant features within its design, such as the control panels, the mural and wooden panelling, or the control room. The structure and the design of the proposed tunnels, whilst engineered in appearance, is considered to be in keeping with the functional character and appearance of the listed Turbine Hall and this element of the proposals would not detract from the overall composition.

5.24 The proposed finish of both tunnels will be bare rock, to match the existing adits and tunnels within the structure. Within the turbine hall, shuttered concrete will be used at the entrance point to match the existing tunnel entrances. This will ensure that the interventions will integrate seamlessly into the existing structure and that any resulting impact would be successfully mitigated, giving rise to a negligible impact on the significance of the listed building.

Creation of new quayside

5.25 The proposed quayside would be a permanent change within the setting of the Category A listed Turbine Hall, through the introduction of new structures within proximity of the main access tunnel entrance. Once operational, the quayside would feature an administrative and storage buildings which are required to facilitate ongoing operation and maintenance of the expanded power station.

5.26 Once again, the proposed quayside will be located below the existing embankment to Loch Awe, to the east of the existing access tunnel. As a result of the topography and position of the quayside and associated structures, these elements of the proposal will not result in any meaningful change to the way in which the main entrance tunnel will be experienced within the landscape. This element of the proposal would give rise to a negligible impact to the significance of the listed building.

Construction of new Upper Intake

5.27 The proposals include the creation of a new upper intake, to the south-east edge of the reservoir, approximately 110m upstream of the dam. Given the nature of this work and the separation distance from the listed Turbine Hall it is considered that this element of the proposal would result in a neutral impact to the setting of the listed building and would not result in any harmful impact to its cultural significance.

Summary

5.28 The operational phase of the development will result in permanent changes to the listed building and its wider setting. As set out above, the creation of a new quayside and the upper intake will have a neutral impact on the significance of the receptor and the principal impact will arise through the permanent alteration to the Turbine Hall as a result of the two new access tunnels. However, the proposed design and materiality of the new tunnels will successfully minimise any potential impact on the character and appearance of the listed building, such that any impact would be minor. A minor impact to a receptor of high sensitivity will result in a **minor adverse** significance of effect.

Ben Cruachan Hydro Electric Scheme, Cruachan Dam

5.29 The proposals do not include any direct works to the Category B listed dam; therefore, any impact will arise through development within its landscape setting.

Construction Phase

5.30 During the construction phase, there will be works within the setting of the listed building which will include the creation of an upper site compound. This compound will be in place for the duration of the construction of the upper control works and will be accessed from the existing dam access road, which will be widened in parts. Following completion of the works, the compound will be removed, and the land restored.

5.31 The upper intake will be located approximately 110m north of the dam structure, as shown in Figure 1 of the Cruachan 2 – Upper Intake and Dam Memorandum, extract provided at **Figure 6**. The works required to facilitate construction includes rock cutting and the creation of a dry works area formed by a coffer dam arrangement. Further details and methodology are provided in the 'Cruachan 2 – Upper Intake and Dam Memorandum' (**Appendix 5**).

5.32 The proposed intake has been relocated from its original position in order to be partially constructed on land and avoid significant periods of outage during construction, which will be undertaken in a phased manner. Details of these are provided in the Memorandum, and this approach ensures that the existing structure will be unaffected by the Proposed Development.

5.33 The changes within the setting of the listed building would be present during the construction period and would result in a temporary minor adverse impact on the setting of the receptor. The remainder of the construction activity, including the quayside and

construction of the underground elements are not considered to result in any meaningful impact on the Category B listed dam.

5.34 During the construction phase, the proposed works will result in a temporary minor adverse impact on the Category B listed Cruachan Dam, through the construction activities which would be relatively localised, at the location of the upper intake and the proposed compound. As such this minor impact on a receptor of medium sensitivity would result in a **minor adverse** significance of effect.

Operational Phase

5.35 During the operational phase, the construction of a new upper intake, would result in a permanent change to the setting of the receptor. The positioning of the proposed upper intake has been carefully considered in order to minimise any potential residual impact. The proposed intake is located c.110m north of the dam and has been designed in such a way as to reduce any potential visual impact, as far as is practicable.

5.36 The new upper intake will appear in views from the public footpath to the west of the reservoir. Appendix 11.1 of the submitted EIAR included a series of visualisations. Image 11.8d of Appendix 11.1 shows the appearance of the upper intake at 10 years post construction (**Figure 7**). It is acknowledged that this will result in a change in appearance to a small section of the hillside; however, the positioning of the intake has been considered to both reduce any potential impact and ensure functionality.

5.37 Change, including development, can sustain, enhance, or better reveal the interest of receptors, as well as detract from or leave it unaltered. The design of proposals affecting the setting of a heritage receptor may play an important part in determining its impact. The contribution of the setting to the historic interest can be sustained or enhanced if new built form is carefully designed to respect their setting, taking account of scale, proportion, height, massing, alignment, and use of materials. Professional judgement is used to consider the impact of future development on the significance of the identified heritage assets.

5.38 Changes within the setting of the Category B listed dam, and any resulting impact should be considered in the context of the industrialised character of the surrounding landscape. As noted in Chapter 11: LVIA of the originally submitted EIAR, the proposed upper intake and associated structure and rock cut will appear similar in appearance to existing bare rock areas and areas of cut that are already present in the landscape. The works include the creation of a hardstanding, the size of which is dictated by the engineering solution associated with the construction of the upper intake and is determined by the proposed

slope of the hillside to be excavated underwater. The hardstanding is required to reinstate the access road to the existing outfall, following construction as well as to allow for the temporary storage of stop logs and the safe manoeuvring of vehicles around the intake for maintenance. The area proposed is the minimum required to meet these needs and allow for safe working practices in this area.

5.39 Embedded landscape mitigation has been included in order to "soften the appearance of the rock cut areas through mounding of stored topsoil / peat at the base of the cut and planting of upland woodland species" (Landscape and Visual Amenity EIAR Chapter 11). These are shown in the visualisation at 11.8d, which shows winter growth. Whilst mitigation delivered by planting is limited, it is considered that the visual appearance of the works is in keeping with the surrounding hillside.

5.40 The Proposed Development is considered to be in keeping with the industrial character of the dam and the scale, and materiality of the proposed upper intake seek to minimise any residual impact on the setting of the listed dam. The proposed colour palate for the hardstanding and plant has been deliberately designed to be recessive and ensure that the Proposed Development will not appear visually prominent within the landscape. This combined with the landscape mitigation, assist in integrating the intake into its landscape setting and will minimise any perceived impact on the setting of the listed building.

5.41 The Proposed Development would therefore result in a permanent change to the setting of the Category B listed Cruachan Dam through the introduction of the new upper intake. However, the intake is functional in its appearance and is considered to be an appropriate feature within the landscape, which already features some degree of modifications and land cut associated with the existing Cruachan Hydro Power Station. As such it is considered that there will be a residual minor impact on the setting of the listed dam. This minor impact on a receptor of medium sensitivity would result in a **minor adverse** significance of effect.

Falls of Cruachan Viaduct

5.42 The proposals do not include any direct works that would affect the sensitivity or significance of the Viaduct, as such any impact would arise through the introduction of new built form within its setting.

Construction Phase

5.43 During the construction phase there would be construction activity in and around the viaduct, including the temporary diversion of the A85 to facilitate construction works. This

diversion would remain in place for 2-4 months during the construction of the initial section of the new main access tunnel. Given that this would utilise an existing 'lay-by' feature within the highway, it is not considered that this element of the proposals would result in any impact on the significance of this receptor.

5.44 The introduction of compounds and construction equipment at the proposed quayside and upper intake would not, by virtue of the separation distances and intervening landscape, topography, and vegetation, result in any meaningful change to the setting of the listed structure, such that there would be a negligible change in terms of the magnitude of impact. Negligible impact to a receptor of high sensitivity would result in a **negligible** significance of effect.

Operational Phase

5.45 Following completion of the temporary construction works, there would be no residual impact on the setting of the Category A listed building. As a result of the existing intervening landscape and topography, combined with the reinstatement of landscaping following construction, there would be a negligible impact on the significance of the receptor, which would result in a **negligible** significance of effect.

Residual Effects

Construction Phase

5.46 The construction phase of the development would result in a minor magnitude of impact to the setting of the built heritage receptors, for a period of approximately 65 months. However, the majority of the works will take place underground and will not result in any impact on the setting of the built heritage receptors. As such, the resulting significance of effect on the Category A listed Cruachan Turbine Hall, Railway Viaduct would be **minor adverse** and the significance of effect on the Category B listed Cruachan Dam would be **negligible.**

Operational Phase

5.47 No mitigation is required in addition to the embedded mitigation within the design of the development. As a result of this, the separation distances as well as the intervening landscape features and topography, the residual effect would be a negligible magnitude of impact which would result in a **minor adverse** significance of effect on the Category A listed Turbine Hall and Viaduct and a **negligible** significance of effect on the Category B listed Dam.

6.0 CONCLUSION AND POLICY ASSESSMENT

6.1 This addendum has been prepared to assess the likely significant effects of the development in respect to built heritage, based on an assessment of the heritage receptors' sensitivity and any contribution made by their setting.

6.2 This document should be read in conjunction with the originally submitted EIAR Chapter. It seeks to provide a more detailed assessment of the potential effects as well as present additional information regarding construction methods for the development as requested by HES and ABC.

6.3 Three receptors were identified through discussions with ABC as requiring a more detailed assessment in relation to the potential effects arising from the proposed development. These comprised the Category A listed Ben Cruachan Hydro Electric Scheme, Turbine Hall and Falls of Cruachan Railway Viaduct and the Category B listed Ben Cruachan Hydro Electric Scheme, Cruachan Dam. The Turbine Hall and Viaduct are high sensitivity, and the Dam is of medium sensitivity.

6.4 The expansion of the Cruachan Hydro Electric Power Station is supported in the National Planning Policy Framework 3 as well as within the Revised Draft NPF4, and emerging Local Development Plan (LDP2). As such the principle of development enjoys a high level of policy support, establishing the principle of development, subject to the statutory consents and detailed planning and design.

6.5 The development proposals have sought to avoid and minimise any potential impact on the setting of the listed buildings at Cruachan Power Station and the Railway Viaduct. The inherent mitigation measures included within the development proposals include the preparation of a CEMP and detailed landscape design to the area around the proposed upper intake, both of which were submitted with the original application.

6.6 As a result of further engagement with the ABC and Historic Environment Scotland, a methodology and plans (**Appendices 5 and 6**) have been prepared to demonstrate the construction methods and provide assurances in relation to the nature of the blasting works to be conducted within the listed Turbine Hall. This includes details of the box enclosures, blast protection, and ventilation systems. The approach taken will ensure that this element of the proposal will not result in any harm to the key heritage features within the turbine hall.

6.7 Overall, the scale and nature of the proposed development is considered in keeping with the industrial character of the listed buildings. The proposals are today, as they were

when the original station was constructed, an achievement of technological and engineering innovation. The Cruachan Expansion Project has been designed to complement the existing Cruachan Power Station and ensure minimal disruption during construction. For the reasons set out in the document, the development is considered to preserve the listed buildings and their settings as well as any features of special interest in accordance with SG LDP ENV16(a) as well as the Scottish Historic Environment Policy.

[i] Scottish Government, National Planning Framework 3 (NPF3), 2014 National Planning Framework 3 - gov.scot (www.gov.scot)
[ii] Scottish Government, Scottish Planning Policy, (SSP), 2022 Scottish Planning Policy - gov.scot (www.gov.scot)
[iii] Argyll & Bute Council. Local Development Plan, 2015 Local Development Plan (argyll-bute.gov.uk)
[iv] Argyll & Bute Council. Draft Local Development Plan 2 Local Development Plan 2 (argyll-bute.gov.uk)
[v] Planning (Listed Buildings and Conservation Areas) Act 1990. http://www.legislation.gov.uk/ukpga/1990/9/contents
[vi] Historic Environment Scotland Policy (HEPS), 2019 Historic Environment Policy for Scotland | Hist Env Scotland
[vii] Historic Environment Scotland: Managing Change: Engineering Structures (2020)
[viii] Historic Environment Scotland: Managing Change in the Historic Environment: Use and Adaptation of Listed Buildings (2020)
[ix] Historic Environment Scotland: Managing Change in the Historic Environment: Setting (2020)
[x] ICOMOS Heritage Impact Assessments for Cultural World Heritage Properties (2011)
[xi] IEMA (2021) Principles of Cultural Heritage
[xii] 'BURRA Charter: Charter for Places of Cultural Significance' (2013).

Appendix 1
HES Comments

From:	adele.shaw@hes.scot
To:	Alan.Brogan@gov.scot; Econsents_Admin@gov.scot
Cc:	sandra.archer@hes.scot; laura.denholm@hes.scot
Subject:	RE: Electricity Act 1989 section 36: consultation - application to construct and operate the Cruachan Expansion Project pumped storage power station
Date:	14 July 2022 11:29:06
Attachments:	image001.png image002.png image003.png image004.png image005.png image006.png

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Dear Alan

Thank you for granting the recent extension to the above case.

Since then, we have received a pre-application consultation on the listed building consent (LBC) application which will require to be granted for this proposed development in addition to the s.36 consent needed. I have also begun the review of the EIA Report for our historic environment interests – in this case, focussed on the impact of the proposals on the category A listed Cruachan turbine hall.

Unfortunately the EIA Report contains very limited information for our interests, and as I understand things from my historic buildings colleagues very little information has been provided so far for the LBC application. For example, I understand that the developer has not asked the planning authority for a view on the extent of the listed building. This would normally be an early step to take in any application involving changes to listed buildings so that it is clear what works will need consent. This also has implications for the EIA process because it means that it is not clear how the developer could have reached a conclusion in the EIA Report about the likely level of impact because we don't know how far the listed structure extends and what aspect of the works are going to have an impact. The EIA Report doesn't explain any of the construction methods which will be used within the listed structure and devolves this information to a future CEMP which the EIA Report states will mean there is no potential for damage to the historic fabric of the listed structure. I'm sorry to say that we will not just be able to take this on face value.

This information will be provided to the planning authority in the first instance as part of the LBC process. Whilst this is a separate regulatory requirement to the application for under section 36 of the Electricity Act, there are obvious links between the two in terms of how the information for the LBC application will inform our understanding of the impacts which are predicted in the EIA Report.

On this basis, would it be possible to extend the deadline for the return of our comments again? Could we extend the deadline to **9 September 2022**?

I would hope by then that we can give you some meaningful advice on the likely level of impact as we will have made a site visit and met the developer to discuss their proposals in more detail. I will caveat this though by saying that our ability to return any advice by this date is going to rely on the level of information that the developer provides us with in the coming weeks.

The alternative course of action at the moment as far as the consultation on the s.36 application goes, would be for us to put in a holding objection by the end of this month which we would then hope to resolve as further information comes forward through the LBC process. I think our preference would be to avoid this, but would be happy to be

guided by what would be most helpful to you at this stage.

I hope that this is acceptable to you, but please do let me know if you would like to discuss any of the issues raised here.

Kind regards

Adele

Adele Shaw ACIfA MRTPI | Deputy Head: Environmental Assessment | Planning, Consents and Advice Service | Heritage Directorate
Pronouns: she/her

We inform and enable good decision-making so that the historic environment of Scotland is valued and protected. Watch our video or sign up to Lintel, our quarterly newsletter, to find out more about our work.

I'm currently working from home and my working days are Monday to Thursday.

Involved in decisions affecting the historic environment? See the Historic Environment Policy for Scotland at www.historicenvironment.scot/heps

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Longmore House, Salisbury Place, Edinburgh, EH9 1SH
M: 07795667577
E: adele.shaw@hes.scot

www.historicenvironment.scot

Heritage For All - read our new Corporate Plan and help to share our vision

From: Alan.Brogan@gov.scot <Alan.Brogan@gov.scot>
Sent: 01 July 2022 15:57
To: Adele Shaw <adele.shaw@hes.scot>; Econsents_Admin@gov.scot
Cc: Sandra Archer <sandra.archer@hes.scot>; Laura Denholm <laura.denholm@hes.scot>
Subject: RE: Electricity Act 1989 section 36: consultation - application to construct and operate the Cruachan Expansion Project pumped storage power station

Adele

I'm happy to grant the extension you've requested.

Alan

From: Adele Shaw <adele.shaw@hes.scot>
Sent: 01 July 2022 07:50
To: Econsents Admin <Econsents_Admin@gov.scot>; Brogan A (Alan) <Alan.Brogan@gov.scot>
Cc: Sandra Archer <sandra.archer@hes.scot>; Laura Denholm <laura.denholm@hes.scot>
Subject: RE: Electricity Act 1989 section 36: consultation - application to construct and operate the Cruachan Expansion Project pumped storage power station

Dear Alan

Thank you for consulting Historic Environment Scotland on the above proposed development.

Unfortunately we are not going to be able to respond by your requested deadline of 4 July. We will need an extension to this deadline to **Friday 29 July**. Please could you confirm that this is acceptable to you?

I apologise for the lengthy extension requested but we are simply unable to respond any sooner due to the high volume of work we are experiencing at the moment.

Kind regards

Adele

Adele Shaw ACIfA MRTPI | Deputy Head: Environmental Assessment | Planning, Consents and Advice Service | Heritage Directorate
Pronouns: she/her

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www.historicenvironment.scot

Heritage For All - read our new Corporate Plan and help to share our vision

From: Alan.Brogan@gov.scot <Alan.Brogan@gov.scot> **On Behalf Of** Econsents_Admin@gov.scot
Sent: 02 June 2022 09:59
To: planning.sw@sepa.org.uk; argyll_outerhebrides@nature.scot; HM - Consultations <HMConsultations@hes.scot>; Andrew.Erskine@transport.gov.scot; Emily.Bridcut@gov.scot; Elaine.Jamieson@forestry.gov.scot; h.mauchlen@bhs.org.uk; radionetworkprotection@bt.com; aerodromes@caa.co.uk; DIO-Safeguarding-Statutory@mod.gov.uk; brian@fms.scot; info@argyllfisheriestrust.co.uk; cm@argyllfisheriestrust.co.uk; robert.younger@fishlegal.net; stuart@mountaineering.scot; scotland.planning@rspb.org.uk; info@scotways.com; PlanningConsultations@scottishwater.co.uk; bwilson@scottishwildlifetrust.org.uk; beryl@chway.plus.com; assetprotection@nationalgrid.com; info@visitscotland.com; AssetProtectionScotland@networkrail.co.uk; hugh.mcbrien@glasgow.gov.uk; gandiccouncil@gmail.com; chriscowley2015@gmail.com; connelcommunitycouncil@gmail.com; marri-ian@hotmail.co.uk; davie@davidsloss.co.uk; inveraray@btinternet.com
Cc: Alexa.Martin@stantec.com; Lynsey.Fraser@stantec.com; Econsents_Admin@gov.scot
Subject: Electricity Act 1989 section 36: consultation - application to construct and operate the Cruachan Expansion Project pumped storage power station

Dear Sir/Madam,

ELECTRICITY ACT 1989

THE ELECTRICITY WORKS (ENVIRONMENTAL IMPACT ASSESSMENT) (SCOTLAND) REGULATIONS 2017

APPLICATION FOR CONSENT UNDER SECTION 36 OF THE ELECTRICITY ACT 1989 FOR CONSTRUCTION AND OPERATION OF THE CRUACHAN EXPANSION PROJECT WITHIN THE PLANNING AUTHORITY OF ARGYLL AND BUTE COUNCIL

Stantec UK Limited on behalf of Drax Cruachan Expansion Limited ("the Company") has submitted an application under section 36 of the Electricity Act 1989 for the Scottish Ministers' consent to construct and operate the Cruachan Expansion Project on land around and to the east of the existing Cruachan pumped storage hydro power station site, between the northern banks of Loch Awe in Argyll and Bute, and Cruachan reservoir (reservoir National Grid Reference NN 080 282). The proposal is entirely within the planning authority of Argyll and Bute Council. The proposed development would provide up to 600MW of generating capacity from stored potential energy, and is subject to Environmental Impact Assessment (EIA). An EIA report has been produced and will be taken into consideration in determining the application.

In accordance with the Electricity (Applications for Consent) Regulations 1990, and the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 ('EIA regulations'), details of the application have been published in the national and local press. The application and EIA report has been made available by the Company on their application website: https://www.cruachanexpansion.com/s36-application/

Additionally a hard copy of the application and the EIA report has been deposited for public inspection at the Cruachan Visitor Centre, Dalmally..

Consultation

The Company have sent you a copy of the application and the EIA report for your consideration. If you have not received this, and cannot access the documentation on any of the websites listed on this email, please contact Stantec by telephone on 0141 352 2360 or by email at getintouch@cruachanexpansion.com.

The EIA regulations allow at least 30 days for responses to this consultation. As a statutory consultee or an organisation likely to be concerned by the proposed development, I would be grateful for your consideration of the application and the EIA report. Please provide your representations regarding the proposal by **4th July 2022**.

The application and all documentation, including the EIA report, can be viewed at https://www.energyconsents.scot/ApplicationDetails.aspx?cr=ECU00004492

Or on the Scottish Government's Energy Consents Unit website homepage www.energyconsents.scot by:

- clicking on ***Search*** tab; then,
- clicking on ***Simple Search*** tab; then,
- typing **Cruachan** into ***Search by Project Name*** box then clicking on ***Go***;
- then clicking on **ECU00004492** and then click on ***Documents*** tab.

Should you have any difficulties accessing the documents or if you require copies in a specific format please let me know.

Please submit your response by email to EconsentsAdmin@gov.scot

Please note reminders are not issued by Energy Consents, therefore if we have not received your comments by 4th July 2022, and you have not contacted me to request an extension to that date before 4th July 2022, I will assume you have no comments to make.

Regards

Alan Brogan | Team Leader | Energy Consents Unit
Scottish Government | 4th Floor, 5 Atlantic Quay | 150 Broomielaw | Glasgow, G2 8LU
Tel: 0131 244 1241 Mob: 07733 308485
To view our current casework please visit **www.energyconsents.scot**

Historic Environment Scotland - Scottish Charity No. SC045925
Registered office: Longmore House, Salisbury Place, Edinburgh, EH9 1SH
Historic Environment Scotland Enterprises Ltd – Company No. SC510997
Registered office: Longmore House, Salisbury Place, Edinburgh, EH9 1SH
Scran Ltd – Company No. SC163518
Registered office: John Sinclair House, 16 Bernard Terrace, Edinburgh, EH8 9NX

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Appendix 2
Site Visit Notes

Cruachan Hydro Electric Power Station

Site Visit - 6 September 2022

Summary of Discussion

Key Points of Discussion	Response
Section 36 Application – Cultural Heritage ES Chapter	
It was acknowledged that the ES Chapter sufficiently assessed the impacts on archaeology but did not provide sufficient assessment in relation to built heritage.	It is proposed to prepare an Addendum to the ES Chapter, focussed on the built heritage impacts. It will include: • Impact of the proposed upper intake on the Category B listed building (Dam). • Impact of the proposed connecting tunnels on the Category A listed building (Turbine Hall / Access Tunnel). • Impact of the proposed quayside on the setting of the Category A listed building (Access tunnel). Following discussions on site we consider that any impact would be low / negligible in EIA terms but understand that this needs to be set out within the ES Addendum.
Listed Building Consent Application (2x connecting tunnels)	
In previous discussions it was advised that the main access tunnel is included within the extent of the designation. However, HES advised that the connecting tunnel between the two main access tunnels was of lesser concern, particularly when considered in the context of the tunnels currently present in the existing main access tunnel. It will need to be included within the listed building consent application. The new opening will be 3.5m in width by 3.5m in height (D-shape). Where the tunnel meets the main access tunnel it will remain finished in the natural rock face, it will also include simple fire doors, set back slightly within the tunnel entrance.	N/A
Regarding the turbine hall, it was explained that the location of the new tunnel had been considered carefully and the proposed location was the only suitable position within the structure. • The existing adit to the north is too small in size and would require significant blasting to enlarge it to the required size. • Any further south and the construction would likely undermine the structural stability of the viewing gallery above and could start to encroach towards existing main access tunnel and the fire doors into the turbine hall.	This will be set out in the Heritage Impact Assessment which will accompany the LBC application.

Key Points of Discussion	Response
The tunnel will be a modern intervention into the 1960s turbine hall and will measure 3.5m in width by 3.5 m in heigh (D-shape), it is purpose is to allow the movement of personnel and machinery between the two stations. The details of the proposed construction have been set out in the presentation (dated 31 August 2022).	All plans will be submitted as part of the application, taking on board comments received in relation to making the information clear and legible and separating out plans where possible.
A detailed discussion was had in relation to the proposed finish / detailing of the connecting tunnel. Suggestions were made by HES in regard to how the new tunnel would sit within the existing turbine hall and whether there was opportunity to provide something of a higher quality, that is reflective of the quality found elsewhere within the structure. The Council's Conservation Officer stated that they were 'in two minds' as to whether this approach was best, or whether a simpler and more scaled back approach would be more appropriate. No solution was proposed during the meeting, but mention of slate tiles was made, as well as the potential to create something 'exciting' that was more of a 'statement'.	This point will be considered further by the project team. However, we would advocate that a proportionate approach is taken in relation to this element of the proposals. The category A listed structure is a working power station and its form and function is visible within its construction. The aesthetic interest of the hall is focussed entirely on the southern elevation, which is the location of the mural, the timber surrounds, and concrete decorative panels. Any approach taken to the finish of the tunnel where it meets the turbine hall must ensure it does not compete with the original fabric of the building, whilst not detracting from it and ensuring that the entrance is fit for purpose.
Concerns were raised previously in relation to protecting the mural from vibrations during construction. It was explained that the level of vibrations arising from the construction would be minimal (£1 coin on top of turbine cannot topple over) in order to ensure no damage to the turbines. It is considered that the levels of vibration would be minimal, contained within the designed temporary protection around the opening.	HES and the Council were satisfied if this was the case, that the potential risk to the mural was minimal. It was agreed that a methodology would be submitted with the LBC application, setting out clearly the parameters and protection measures to give comfort that no damage would occur to the mural. It was not considered necessary to remove, clean and reinstate the mural.
Replacement of turbines 3 & 4	
Turbines 3 & 4 are nearing the end of their life and the machinery contained underground and within the housing requires replacement. It is proposed that the existing turbines, including their housing are dismantled and the internal workings removed from site. New turbines will be installed, and the existing housing reinstated. The 'caps' on the top of the two turbine houses will be replaced with modern 'caps' to further dampen noise when the pump/ turbines are operating. This is the only change to the visual appearance of the turbines and the turbine hall.	HES and Argyll & Bute Council to confirm whether or not the proposed works as detailed would require an application for LBC.

Key Points of Discussion	Response
The statutory test for whether listed building consent is required is where the "*…demolition of a listed building or for its alteration or extension in any manner which would* ***affect its character*** *as a building of special architectural or historic interest.'* We consider that the replacement of turbines 3 & 4 would be repairs and that the turbine machinery would not have reasonably been considered to fall within the scope of the listing. To do so would have been to prevent any repairs / maintenance and replacement of component parts of the working elements of the power plant without the appropriate consent. It is also considered that the replacement of the 'cap' to the top of the turbine housings would not affect the character or the special architectural or historic interest of the listed building. As such, we propose that this work could be undertaken without the need for listed building consent.	

End

Appendix 3
Designations & Descriptions

Listed Building

The only legal part of the listing under the Planning (Listing Buildings and Conservation Areas) (Scotland) Act 1997 is the address/name of site. Addresses and building names may have changed since the date of listing – see 'About Listed Buildings' below for more information. The further details below the 'Address/Name of Site' are provided for information purposes only.

Address/Name of Site

BEN CRUACHAN HYDRO ELECTRIC SCHEME, TURBINE HALL

LB51688

Status: Designated

Documents

There are no additional online documents for this record.

Summary

Category
A

Date Added
11/02/2011

Local Authority
Argyll And Bute

Planning Authority
Argyll And Bute

Parish
Ardchattan And Muckairn

NGR
NN 07990 26720

Coordinates
207990, 726720

Description

James Williamson and Partners; George Rennie (resident engineer for North of Scotland hydro Electric Board technical panel); J B Armstrong (architect); 1959-65. Monumental underground barrel vaulted chamber forming turbine hall hollowed out from solid bedrock with long sloping vaulted access tunnel; additional chambers housing transformers and tunnels, one forming access roadway to machine hall. Large turbine hall 36 metres high, 90 metres long with viewing gallery to NE corner at upper level and concrete lined vaulted roof. Regularly spaced columns to N supporting track for overhead gantry cranes.

Tiled floor. Control panels to S wall with large inlaid timber mural by Elizabeth Faulkner above to SE. Alternating timber panels and acoustic baffling panels of concrete consisting of regular geometric shapes to remainder of S wall. Offices to S including control room at upper level with projecting faceted timber and plate glass window overlooking turbine hall floor; transformer room and surge shaft to far S. Large overhead lighting panels with lights contained by panelled timber wings cantilevered from large central beam. Matt grey square ceramic tiles to entrance and replacement tiles to turbine hall.

ACCESS TUNNEL: vaulted vehicular access tunnel running for 1 kilometre from tunnel entrance. Terminating in round arched entrance to turbine hall lined with rectangular slate tiles. Pedestrian entrance to offices directly adjacent to left (E) with split slate tiles forming apron around doorway.

Statement of Special Interest

Ben Cruachan Turbine hall forms and A-group with Ben Cruachan Dam (see separate listing). Ben Cruachan turbine hall is a monumental engineering achievement and an integral part of one Britain's most innovative hydro electric power schemes and the first example of the use of reversible turbine pumped storage technology. The 3240 cubic metre turbine hall was hollowed out entirely from solid bedrock and is set deep within the side of the Ben Cruachan ridge. The turbine hall is accessed by a 1 kilometre long vehicular access tunnel. The lower end of the tunnel terminates in 'the crossroads' where secondary tunnels give access to visitors viewing gallery, transformer hall and surge shaft. The housing of a power station of this scale wholly underground in addition to secondary features such as transformers and pressure tunnels was pioneering and allowed for the development of a power station large enough to play a nationally significant role in energy supply in an area renowned for scenic beauty with very limited visual impact. The station exhibits a number of period design features dating from the 1960s including the timber artwork panel by Elizabeth Faulkner and careful attention to detail in lighting and acoustic design, all with imaginative uses of timber and concrete.

Cruachan was groundbreaking in its use of pumped storage when it was opened by the Queen in 1965, and still provides vital peak load capacity today. During periods of cheap electricity the turbines are run in reverse to pump water from Loch Awe back up into the reservoir, a process which provides 90% of the water used for generation by the station. Prior to the design of Cruachan pumped storage facilities had required separate pumps and a separate pipe network to pump water back into reservoirs, making them much more expensive to build than conventional hydro systems. The use of reversible turbines at Cruachan was highly innovative and removed the costly requirement for separate pumping infrastructure. The reversible technology was first developed in the

1930s, but Cruachan was one of the first large-scale applications in Europe. The Lünerseewerk station of 1958 in Austria pre-dates Cruachan, but has a smaller capacity of 232 MW. The technology became more widely used, in Britain and worldwide, from the later 1960s onwards with further schemes in Wales at Ffestiniog in 1963 with a 360MW station

The turbine hall houses four turbines capable of a combined capacity of 440MW with 2 sets generating at 120 MW and the original 2 at 100MW. Each set uses approximately 110MW of power to pump water back up to the dam (see separate listing). The station can move from standstill to full generating output in under 2 minutes, compared to a time of several hours for a thermal power station. The station fulfils a key strategic requirement for the UK with the capability to produce enough power to re-start essential services nationwide (a so called 'Black Start').

Cruachan was the penultimate of the major post-war hydro electric developments by the North of Scotland Hydro electric Board (NoSHEB). The scheme played a key role in the realisation of the social agenda of NoSHEB by generating electricity which could be easily exported to the grid (via a connection at Windyhill on the fringe of Glasgow) and sold to Scotland's central belt. Revenue from the sale of the power subsidised the provision of electricity to remote north Highland communities on loss making schemes and stimulated economic regeneration. Under the leadership of eminent chairman Sir Tom Johnston the board undertook developments throughout Highland Scotland. This commitment saw the development of schemes in locations such as Loch Dubh near Ullapool and Storr Lochs on Skye. Johnstone's social aspirations ensured these schemes remained a key part of the NoSHEB development plan.

The design is typical of Williamson and Partners approach. James Williamson had completed a large number of innovative designs on behalf of NoSHEB, including developing the buttress dam which he first used at Loch Sloy (see separate listing) before his death in 1953. The scale and degree of innovation behind the plans for Cruachan is characteristic of the skill of the firm and their long experience with hydro power and commitment to developing Scotland's resources. Williamson had specialised in the design of dams following his work on the Galloway Hydro Electric scheme (see separate listings) in the 1930s. He acted as one of the chief engineering advisors to NoSHEB and was the lead engineer for a number of schemes before his death in 1953. After this date the company of James Williamson and Partners continued to be closely involved in the work of NoSHEB and were the lead team of engineers on a number of schemes, including Cruachan.

(Listed 2011 as part of Hydro Electric Power Thematic Survey)

References

Bibliography

National Archives of Scotland (NAS), Ref: NSE North of Scotland Hydro Electric Board Collection (1943 -1990); NAS, Ref: NSE1 North of Scotland Hydro Electric Board Minutes (1943-1990); NAS, Ref NSE2 North of Scotland Hydro Electric Board Annual Reports (1943-1990); Peter Payne, The Hydro: A Study of the Development of the Major Hydro-Electric Schemes Undertaken by the North of Scotland Hydro-Electric Board, (1988); Emma Wood, The Hydro Boys, (2002), p178-79; J Miller, The Dam Builders: Power from the Glens, 2002, p230-40; F A Walker, The Buildings of Scotland: Argyll and Bute (2000) p375.

About Listed Buildings

Historic Environment Scotland is responsible for designating sites and places at the national level. These designations are Scheduled monuments, Listed buildings, Inventory of gardens and designed landscapes and Inventory of historic battlefields.

We make recommendations to the Scottish Government about historic marine protected areas, and the Scottish Ministers decide whether to designate.

Listing is the process that identifies, designates and provides statutory protection for buildings of special architectural or historic interest as set out in the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997.

We list buildings which are found to be of special architectural or historic interest using the selection guidance published in Designation Policy and Selection Guidance (2019)

Listed building records provide an indication of the special architectural or historic interest of the listed building which has been identified by its statutory address. The description and additional information provided are supplementary and have no legal weight.

These records are not definitive historical accounts or a complete description of the building(s). If part of a building is not described it does not mean it is not listed. The format of the listed building record has changed over time. Earlier records may be brief and some information will not have been recorded.

The legal part of the listing is the address/name of site which is known as the statutory address. Other than the name or address of a listed building, further details are provided for information purposes only. Historic Environment

Scotland does not accept any liability for any loss or damage suffered as a consequence of inaccuracies in the information provided. Addresses and building names may have changed since the date of listing. Even if a number or name is missing from a listing address it will still be listed. Listing covers both the exterior and the interior and any object or structure fixed to the building. Listing also applies to buildings or structures not physically attached but which are part of the curtilage (or land) of the listed building as long as they were erected before 1 July 1948.

While Historic Environment Scotland is responsible for designating listed buildings, the planning authority is responsible for determining what is covered by the listing, including what is listed through curtilage. However, for listed buildings designated or for listings amended from 1 October 2015, legal exclusions to the listing may apply.

If part of a building is not listed, it will say that it is excluded in the statutory address and in the statement of special interest in the listed building record. The statement will use the word 'excluding' and quote the relevant section of the 1997 Act. Some earlier listed building records may use the word 'excluding', but if the Act is not quoted, the record has not been revised to reflect subsequent legislation.

Listed building consent is required for changes to a listed building which affect its character as a building of special architectural or historic interest. The relevant planning authority is the point of contact for applications for listed building consent.

Find out more about listing and our other designations at www.historicenvironment.scot/advice-and-support. You can contact us on 0131 668 8914 or at designations@hes.scot.

Images

There are no images available for this record.
Printed: 11/12/2022 16:53

Appendix 4
Drawings & Figures

Site Boundary

Coire Dearg
Fords
Waterfall
Tunnel Entrance
Outlet
Coire Cruachan
Allt Cruachan
Ford
Cruachan Reservoir
Pillar
Tunnel Entrance
Pillar
Outlet
Pillar
Intakes
Tunnel Entrance
Cruachan Dam
Pillar
Lairig Torran
Beinn a' Bhuiridh
897
Monadh Driseig
641
Allt Coire Chreachainn
Allt Coire Ghlais
Coire Glas
Reservoir
Quarry (disused)
Quarries (disused)
Sheepfold
Corries
Homestead
Castles Farm
Ford
Barran an Tuirc
Allt Mhoille
River Strae
B8077
Drishaig
Creagan Geoidh
Kilchurn Castle
Creag a' Gheoidh
Hotel
Pier
PO
Creag na Circe
Coille Driseig
Lochawe
Creagan a' Bhuic
Slipway
Rubha Fionn Uillt
St Conan's Kirk
Crannog
Quarry (disused)
Sewage Works
Sàilean Rubha Dubhairt
Rubha Dubhairt
Pit (dis)
Ardteatle Cottage
Cairn
Lag na Luinge
Badan Tomain
Innis Chonain
Jetty
Creag an Fharaidh
Falls of Cruachan
Cruachan Power Station
Falls of Cruachan Station
Tunnel Entrance
A85
Creag a' Bhodaich
Allt Lorgaidh
Intakes
Outlet
Intake
Old Military Road
Sheep Creep
Coille Leitire
Tigh Cherracher
Fionn Allt
Creag a' Chuil
Dam
Tervine
Jetty
Sheepfold
Quarry (disused)
MS
FB
Ford
27
28
29
30
26

CRUACHAN EXPANSION PROJECT

Site Location Plan

Client: Drax Generation Enterprise Ltd

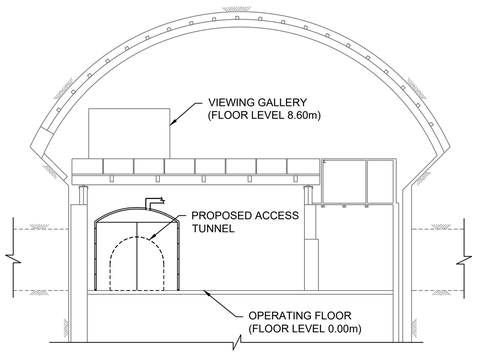
0 0.5 1 km

1:17,500 @ A3 | Date: 03/03/2022

Drawn: JP | Checked: CL

Figure 1.1 | Rev D

Document Path: Z:\Projects\332010112\02_mxd\332010112_SiteLocation_20220202.mxd



SECTION A-A

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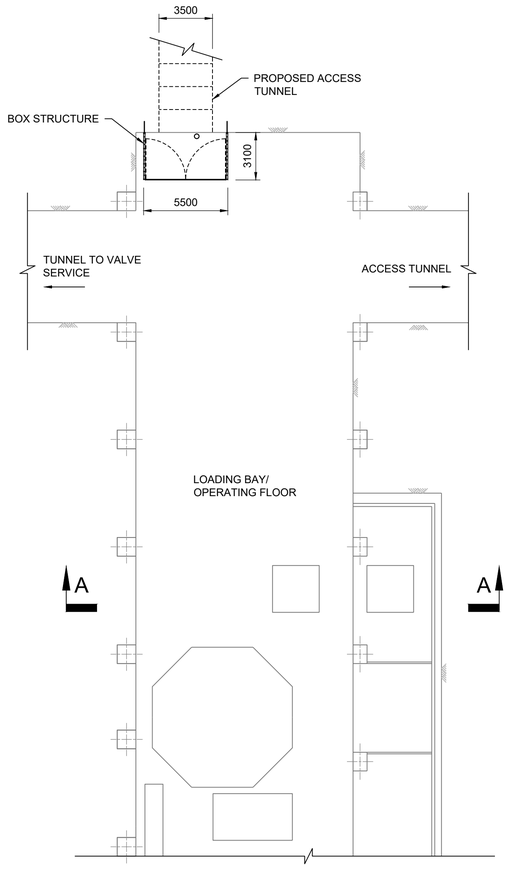

OPERATING FLOOR
PLAN AT 0.00m

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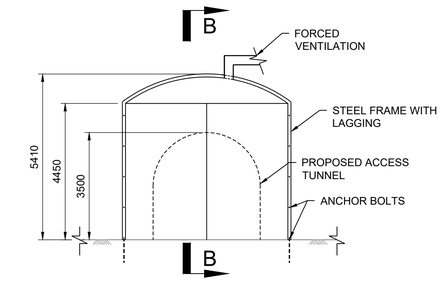
STAGE 1: INSTALLATION OF BOX STRUCTURE WITH VENTILATION DUCT AT FACE OF PROPOSED ACCESS TUNNEL.



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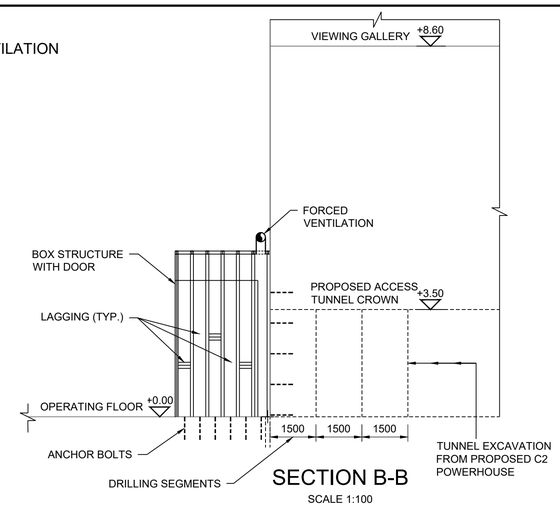

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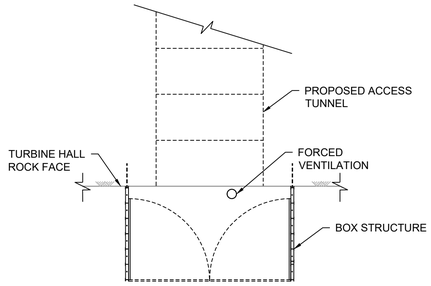
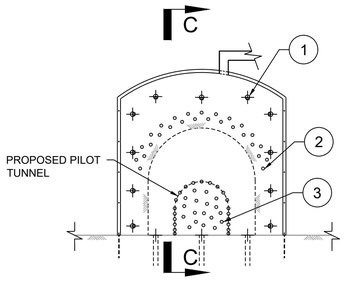


PLAN

SCALE 1:100

STAGE 2: DRILLING AND INSTALLATION OF TEMPORARY ROPE ANCHORS, FULLY GROUTED-POST TENSIONED ROCK BOLTS, DRILLING FOR PILOT TUNNEL.



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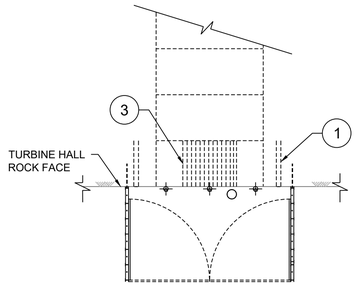

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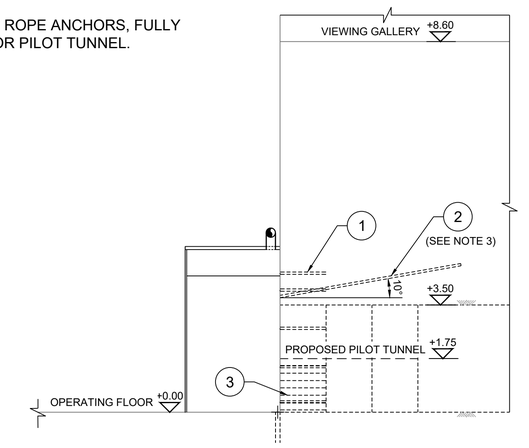

SECTION C-C

SCALE 1:100

ITEM DESCRIPTION	
ITEM	DESCRIPTION
1	TEMPORARY ROPE ANCHORS WITH EYE NUT AND SHACKLES
2	FULLY GROUTED POST-TENSIONED ROCK BOLTS
3	ACCESS TUNNEL DRILL HOLES (TYP.)

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES UNLESS SHOWN OTHERWISE.
2. THIS IS A CONCEPT DRAWING TO ILLUSTRATE THE CONSTRUCTION STAGES. ALL DIMENSIONS AND ELEVATIONS ARE APPROXIMATE AND WILL BE REVIEWED AND UPDATED AS PROJECT DESIGN STUDIES CONTINUE. ALL CONCEPTS, DETAILS, DIMENSIONS AND ELEVATIONS INDICATED ON THIS DRAWING WILL REQUIRE FURTHER REFINEMENT DURING A SUBSEQUENT DESIGN PHASE.
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8. ROCK SUPPORT GROUND CONTROL MEASURES SHALL BE DESIGNED SUBJECT TO GROUND INVESTIGATIONS AND ENCOUNTERED GROUND CONDITIONS.

LEGEND

X → ITEM

SCALE 1 : 100

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SCALE 1 : 200

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CURRENT VERSION INFORMATION

DATE	DRWN	CHKD	REVD	VER	REASON FOR ISSUE
17.08.22	RA	SS	JW	A	FOR INFORMATION

DRAX CRUACHAN EXPANSION LTD

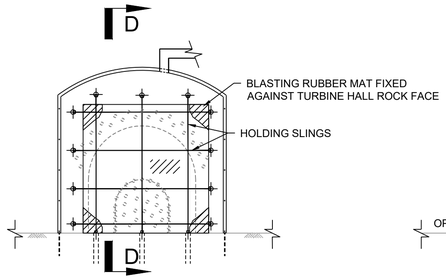
CRUACHAN 2

NORTHEAST WALL ACCESS TUNNEL
CONSTRUCTION STAGES - CONCEPT

CONTRACT NO.	SCALE	MASTER SIZE
001	AS SHOWN	A1

DRAWING NO.	VERSION
331201086/001/C/0200	A

STAGE 3: CHARGING OF PILOT TUNNEL DRILL HOLES, INSTALLATION OF BLASTING MAT, CLOSING OF MAIN DOOR, BLASTING (SEE NOTE 4).



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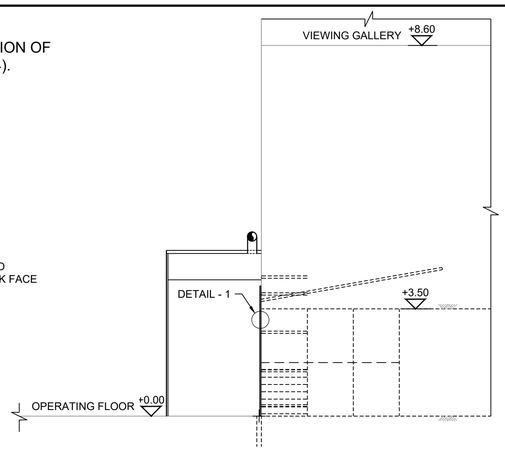

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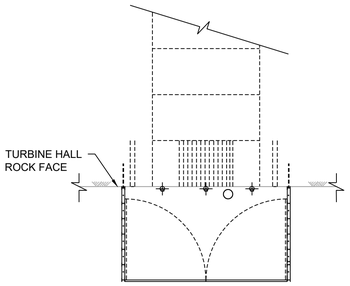

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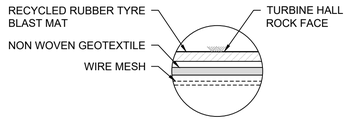

DETAIL- 1
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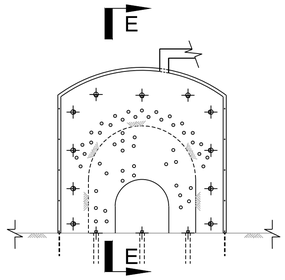
STAGE 4: VENTILATION OF BLAST SMOKE, REMOVAL OF BLAST MAT, MUCKING OF PILOT TUNNEL, AND DRILLING FOR ENLARGING THE ACCESS TUNNEL.



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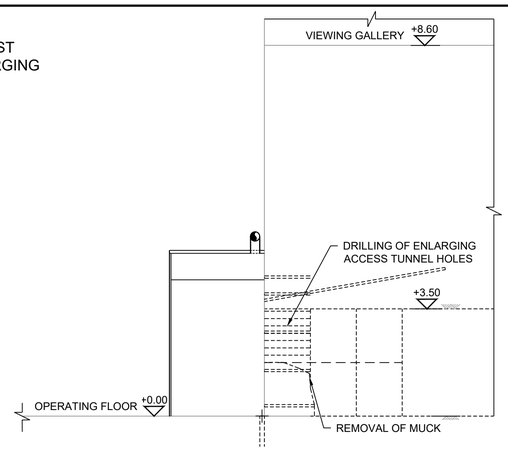

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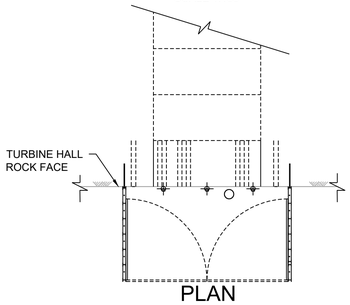

PLAN
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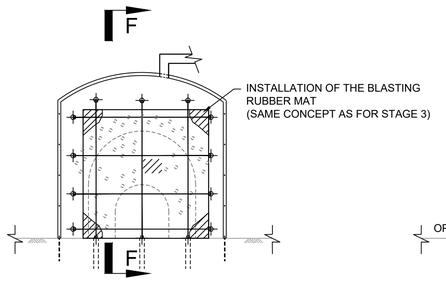
STAGE 5: CHARGING OF THE ENLARGING DRILL HOLES, INSTALLATION OF BLASTING MAT, CLOSING OF MAIN DOOR, BLASTING.



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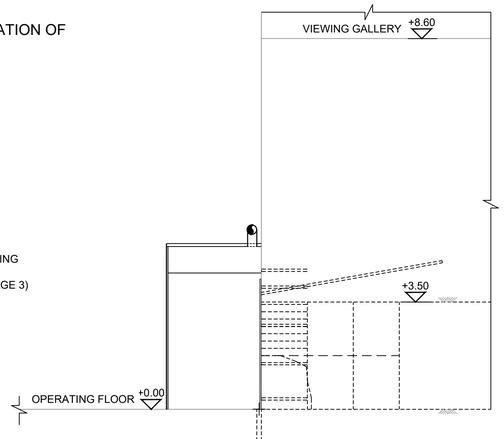

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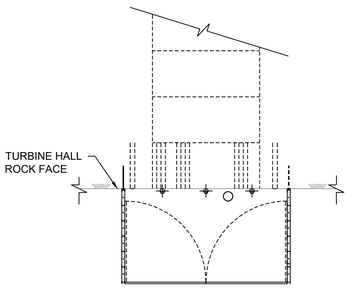

PLAN
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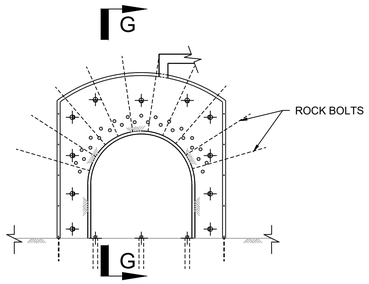
STAGE 6: VENTILATION OF BLAST SMOKE, REMOVAL OF BLAST MAT, MUCKING, INSTALATION OF ROCK SUPPORTS AND STEEL RIBS SUPPORTS.



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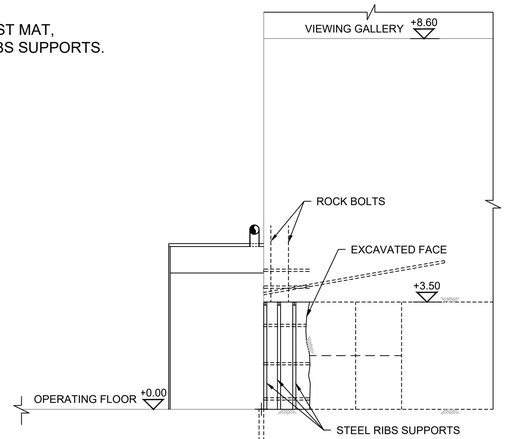

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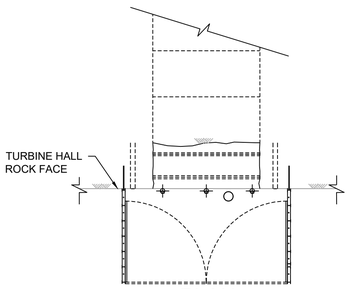

PLAN
SCALE 1:100

NOTES

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LEGEND

X → ITEM

SCALE 1 : 100

m1 0 10m

CURRENT VERSION INFORMATION

DATE	DRWN	CHKD	REVD	VER	REASON FOR ISSUE
17.08.22	RA	SS	JW	A	FOR INFORMATION

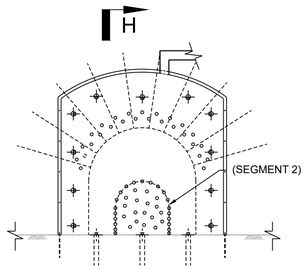
DRAX CRUACHAN EXPANSION LTD
CRUACHAN 2

NORTHEAST WALL ACCESS TUNNEL
CONSTRUCTION STAGES - CONCEPT

CONTRACT NO.	SCALE	MASTER SIZE
001	1:100	A1

DRAWING NO.	VERSION
331201086/001/C/0201	A

STAGE 7: DRILLING FOR THE PILOT TUNNEL.
(REPEAT OF STAGE 2 TO STAGE 6 FOR SUBSEQUENT DRILLING SEGMENTS)



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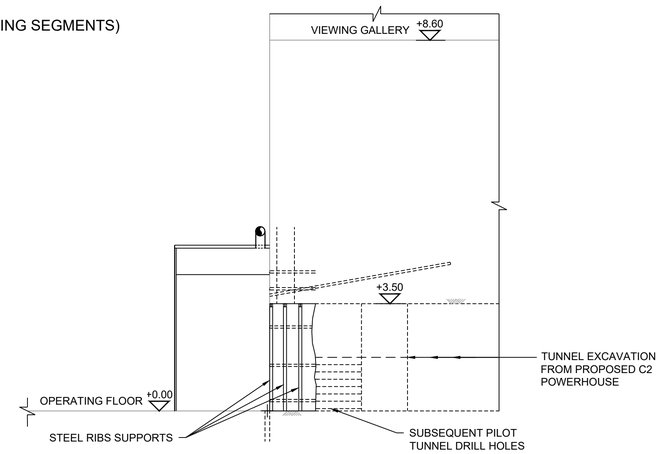

SECTION H-H
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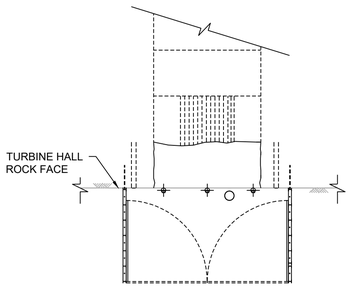

PLAN
SCALE 1:100

NOTES

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LEGEND

X → ITEM

SCALE 1 : 100

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DATE	DRWN	CHKD	REVD	VER	REASON FOR ISSUE
17.08.22	RA	SS	JW	A	FOR INFORMATION

DRAX CRUACHAN EXPANSION LTD
CRUACHAN 2

NORTHEAST WALL ACCESS TUNNEL
CONSTRUCTION STAGES - CONCEPT

CONTRACT NO.	SCALE	MASTER SIZE
01	1:100	A1
DRAWING NO. 331201086/01/C/0202		VERSION A

Cruachan Expansion Project

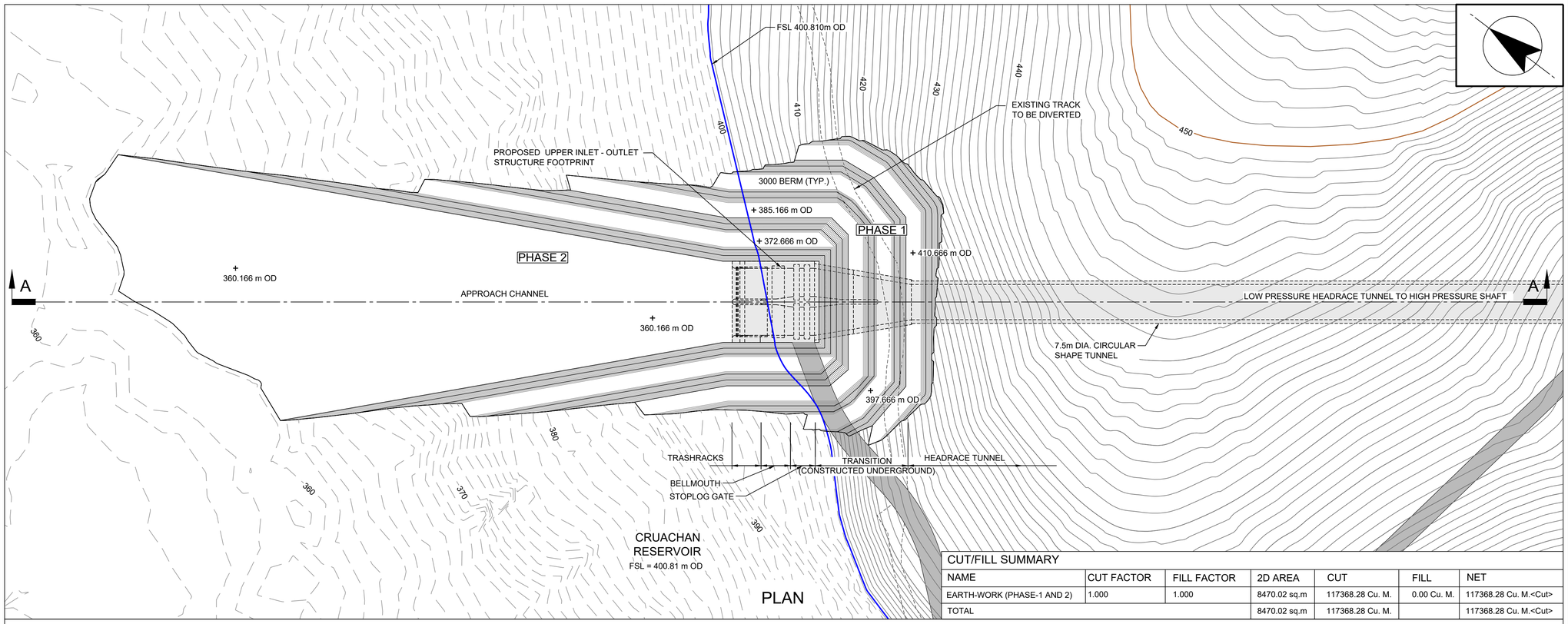
Figure 11.7d – Visualisation of Proposed Quayside Structure from above Tervine: Photomontage (10 Years After Completion)

NOTE: This photomontage shows the anticipated situation during operation, after 10 years. The positioning and growth of vegetation is estimated and indicative.

OS reference:	208092 E 725890 N	Camera:	Canon EOS 5D mk II	Horizontal field of view:	53.5° (planar projection)
Ground level:	61.7 m AOD	Lens:	50mm (Canon EF 50mm f/1.4)	Principal distance:	812.5 mm
Direction of view:	9°	Camera height:	1.5m AGL	Paper size:	841 x 297 mm (half A1)
Distance to Proposed Development:	1001.5 m	Date and time:	27/01/2022 11:05	Correct printed image size:	820 x 260 mm

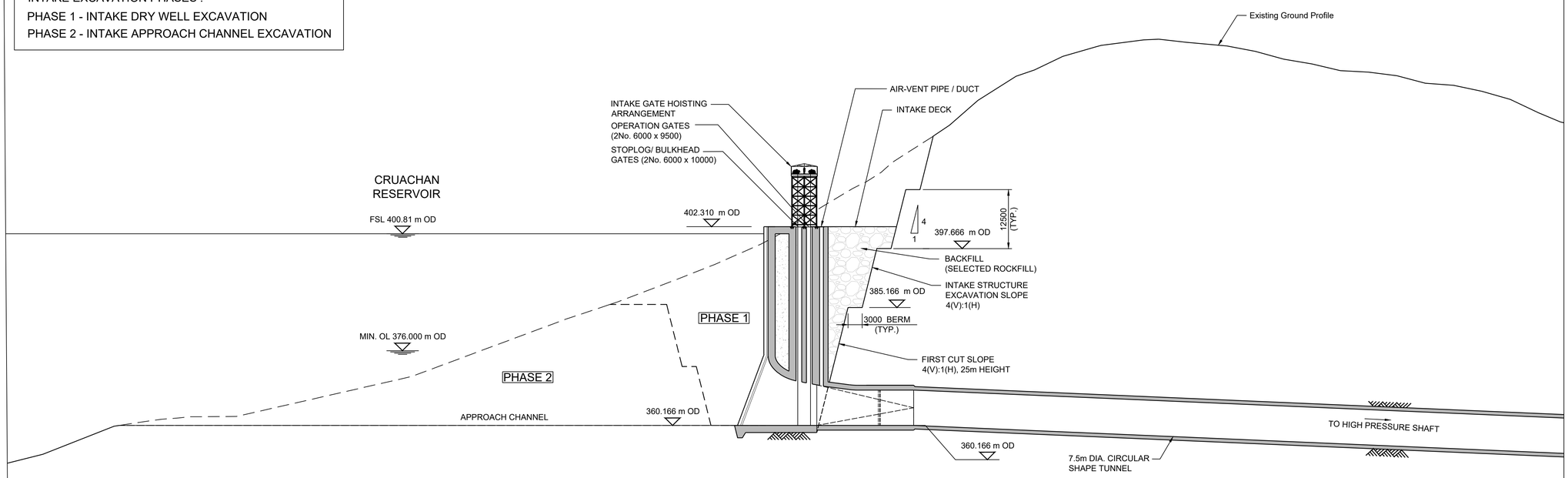
Drawing No. • 121001-2-LV11.7d-1.0.0 Date • 12.05.2022

Stantec drax ash



CUT/FILL SUMMARY						
NAME	CUT FACTOR	FILL FACTOR	2D AREA	CUT	FILL	NET
EARTH-WORK (PHASE-1 AND 2)	1.000	1.000	8470.02 sq.m	117368.28 Cu. M.	0.00 Cu. M.	117368.28 Cu. M.<Cut>
TOTAL			8470.02 sq.m	117368.28 Cu. M.		117368.28 Cu. M.<Cut>

INTAKE EXCAVATION PHASES :
PHASE 1 - INTAKE DRY WELL EXCAVATION
PHASE 2 - INTAKE APPROACH CHANNEL EXCAVATION



SECTION A-A

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES UNLESS SHOWN OTHERWISE.
2. THIS IS A CONCEPT PHASE DRAWING TO ILLUSTRATE THE PROJECT BASE CASE. ALL DIMENSIONS AND ELEVATIONS ARE APPROXIMATE AND WILL BE REVIEWED AND UPDATED AS PROJECT DESIGN STUDIES CONTINUE. ALL CONCEPTS, DETAILS, DIMENSIONS AND ELEVATIONS INDICATED ON THIS DRAWING WILL REQUIRE FURTHER REFINEMENT DURING A SUBSEQUENT DESIGN PHASE.

LEGEND

EXISTING CONTOURS

BATHYMETRIC CONTOURS

REFERENCE

331201086/01/C/0710 PLAN AND SECTION - PHASE 1 - EXCAVATION

SCALE 1 : 500

m10 0 40m

CURRENT VERSION INFORMATION

B. HEADRACE TUNNEL DIAMETER UPDATED.

DATE	DRWN	CHKD	REVD	VER	REASON FOR ISSUE
28.02.22	PPS	SS	CS	B	FOR INFORMATION
01.02.21	RRS	SS	CS	A	FOR INFORMATION

DRAX CRUACHAN EXPANSION LTD
CRUACHAN 2

UPPER INTAKE STRUCTURE
PLAN AND SECTION
PHASE 2 - EXCAVATION
OPTION-5

drax

Stantec

CONTRACT NO.	SCALE	MASTER SIZE
01	1:500	A1
DRAWING NO. 331201086/01/C/0711		VERSION B

Cruachan Expansion Project

Figure 11.8d – Visualisation of Proposed Upper Intake Structure from Cruachan Reservoir Track: Photomontage (10 Years After Completion)

NOTE: This photomontage shows the anticipated situation during operation, after 10 years. The positioning and growth of vegetation is estimated and indicative.

OS reference:	207840 E 728343 N	Camera:	Canon EOS 5D mk II	Horizontal field of view:	53.5° (planar projection)
Ground level:	414.9 m AOD	Lens:	50mm (Canon EF 50mm f/1.4)	Principal distance:	812.5 mm
Direction of view:	114°	Camera height:	1.5m AGL	Paper size:	841 x 297 mm (half A1)
Distance to Proposed Development:	380.1 m	Date and time:	02/03/2022 13:27	Correct printed image size:	820 x 260 mm

Drawing No. - 121001-2-LV11JR6-1.0.0 Date - 12.05.2022

Stantec drax ash

Appendix 5
Cruachan 2 – Upper Intake and Dam Memorandum
Cruachan 2 – Access Tunnels Connecting Powerhouse and MAT Memorandum

Stantec

Memo

To:	Alexa Martin	Prepared by:	Sandip Shinde
Client:	Drax Cruachan Expansion	Checked by:	James Weddle
Project:	Cruachan Expansion Project	Reviewed by:	Craig Scott
Reference:	Upper Intake / Outlet Structure	Date:	December 13, 2022

1. Purpose of this Memorandum

During the review of the Section 36 application for the Cruachan 2 Expansion Project, Historic Environment Scotland (HES) and Argyll and Bute Council (ABC) requested a method statement that elaborates on the possible protection measures for the existing Cruachan dam, a Category B listed structure of a national importance and how it will be protected/not impacted during the construction of the new upper inlet-outlet (intake) structure.

This technical memorandum describes the layout arrangement and construction stages for the proposed upper intake structure, and how the Cruachan dam might be protected during construction.

2. Upper Inlet / Outlet Works at Cruachan Reservoir

The proposed upper intake structure for the Cruachan 2 Expansion Project is located on the South-Eastern reservoir rim, approximately 110 m upstream of the Cruachan dam axis. To minimise the duration of the outage of the existing Cruachan pumped storage scheme during construction, the intake structure is proposed to be constructed within a temporary dry well created by a piled cofferdam. The rock cutting beyond the proposed intake deck level and within the dry well is intended to be excavated by conventional controlled excavation incorporating blasting techniques and supported by rock support. The power station inlet is provided with a bell mouth entrance to minimise the head losses in either direction. The intake dry deck is placed above the full supply level. The intake gates will be operated by a control system and accessed from the deck platform.

The proposed intake structure is located between the Awe village drainage tunnel outfall structure and Cruachan dam axis. Moving the intake structure further north from the currently proposed location would necessitate a need for relocating the drainage tunnel outfall structure. The intake structure is about 110 m away from the dam axis and the location was considered to be adequate distance from the dam, and it is unlikely that the construction of the intake structure will pose a significant safety hazard to the Cruachan dam provided controlled blasting techniques are adopted by the Contractor.

According to the British Geological Survey (BGS) mapping Sheet 45E, the upper intake structure was found to be underlain by Quartz Diorite and Diorite of the Quarry Formation. Outcrops in the vicinity of the structure were recently geologically mapped by Stantec and have typically confirmed the mapping by the BGS and indicate the rockmass to be “massive” (sparely jointed and largely intact) competent rock. This rock type is similar to that of granite and can be effectively excavated using controlled blasting techniques which are often adopted in the construction of dams to help mitigate ground vibrations and control damage to the rockmass (“overbreak”) beyond the intended design “neatlines”. Stantec’s current observations indicate that the siting of the new structure is favourable from a geological perspective. Faulting and shear zones not currently visible at the outcrop are anticipated to lie within the vicinity of the dam left abutment and are potentially anticipated to cross the new structure and may locally influence blasting and the transmission and attenuation of blasting ground vibrations and will be considered in further detail during the next phases of the studies.

The layout arrangement for the upper inlet-outlet structure is shown in Figure 1.

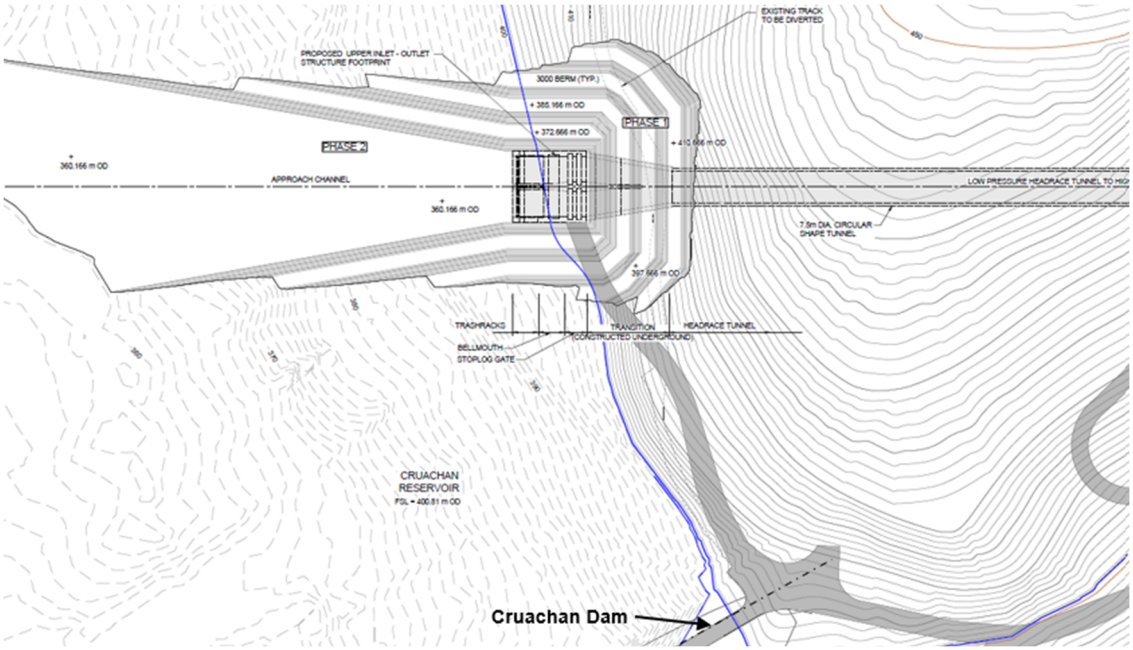


Figure 1: Proposed Upper Inlet-Outlet Structure - Plan

3. Construction of the Upper Inlet / Outlet Structure

The construction works for the proposed intake works will require oversight by an All-Reservoirs Panel Engineer, appointed under the Reservoirs (Scotland) Act, 2011 to ensure that the safety of the Cruachan dam is upheld during the construction of the intake structure. The intake structure will be constructed in a 'dry well' created by constructing a temporary piled cofferdam around the proposed structure. It will allow works in the dry while the Cruachan reservoir is maintained for operation. The proposed dry well intake arrangement is shown in Figure 2.

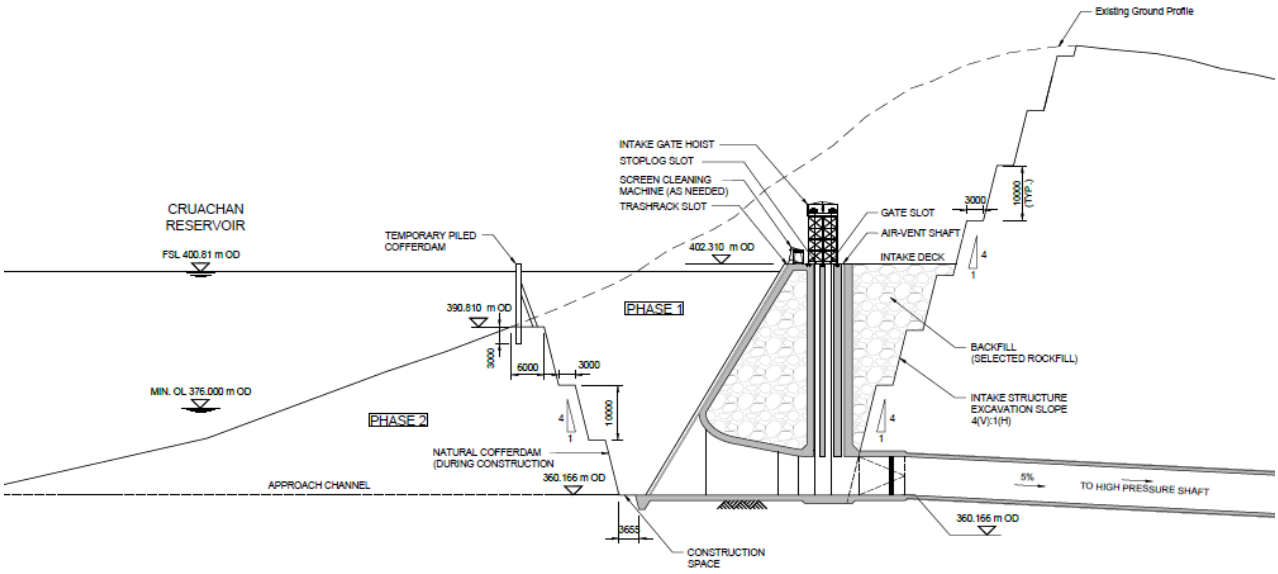


Figure 2: Upper Inlet/outlet Structure – Construction Phases

The construction of the upper intake structure will be undertaken in a phased manner. Nine (9) construction phases are foreseen, and they are:

Phase 1: Undertake test blasting which will be followed by mass excavation to the proposed intake deck level and progressively install rock support as required and monitor blast vibrations and overpressure.

Phase 2: Installation of the piled cofferdam to isolate the construction area for the intake structure

Phase 3: Dewatering and excavation of the intake trench (dry well) and further installation of rock support.

Phase 4: Excavation for the tunnel portal and slope treatment

Phase 5: Construction of the intake structure

Phase 6: Installation of the hydromechanical works (trash racks, gates, hoists, etc.) and dry commissioning

Phase 7: Removal of the piled cofferdam and lowering of the reservoir to facilitate excavation for the natural cofferdam and approach channel

Phase 8: Excavation for the natural cofferdam and approach channel and ongoing installation of rock support.

Phase 9: Wet commissioning and monitoring

The rock excavation to the intake deck level can be undertaken independently following a series of test blasts by a specialist blasting contractor. The results of the test blast will be reviewed and approved by the owner's engineer. Monitoring at sensitive structures like the existing Dam for blast-induced vibration and air/water overpressure shall be undertaken and maintained below agreed thresholds. The existing access road along the left abutment can be extended and used for excavation activities and pioneer access cut into the top of the slope.

Rock excavation and smooth wall-controlled blasting would commence from the top of the rock cutting in benches with an exposed free face above the full supply level and then advancing below into the "dry well" or "sinking cut" as it's known in blasting /rock engineering which is confined on all sides. It is this section of the rock cutting that is most likely to generate elevated ground vibrations which would require close monitoring in order to maintain ground vibration and air/water overpressure below the determined threshold for the existing listed Dam structure.

The excavated slopes are anticipated to be 1(H) to 4(V) for the rock. 3 m wide berms are proposed every 10 m (height) along the cut slope (except near the intake portal) and will be provided with drainage gutters. The Phase 1 excavation will create a 40m to 50m platform. The platform will be used for storing and handling the piles used to build the cofferdam.

For the concept design, a RD or Combi pile temporary cofferdam with a 15 m retained height of the water is considered. The cofferdam arrangement, its stability, constructability, etc., will be studied as the site-specific geological and geotechnical information becomes available during the next phase of the studies.

Excavation and installation of the piled cofferdam can be undertaken from the shore or floating barge on the reservoir. The piles will be drilled to a suitable depth to create a water-tight barrier between the Cruachan reservoir and the dry well. If needed, the natural ground surrounding the cofferdam supporting piles will be injected with the grout to create a water-tight barrier around the dry well. Following the first stage of dewatering to expose bedrock below the existing reservoir level, the excavation of the sinking cut will commence using controlled blasting techniques to form the intake excavation.

Subject to the results of test blasting and the attenuation of ground vibration Stantec anticipate that mitigation of blasting vibration might be necessary and are likely to be a combination of reduction of the maximum instantaneous charge, decking of explosive, electrically programmable delays. The mitigation of air/water overpressure would typically be undertaken utilising appropriate blast design, eliminating or the use of detonation cord on the surface, for example, matting of blasts and suitable stemming in the charged borehole to name some. Measures to mitigate overpressure underwater may include the use of bubble curtains, placed suitably around the periphery of the temporary cofferdam within the reservoir. The air bubble curtains are extensively used for reducing the velocity and increasing attenuation of the acoustic (shock) waves transmitted through the rock into the water beyond the cofferdam and onto the existing dam structure.

Fly rock would also be closely managed and controlled from blasting, this may include measures utilised by the contractor such as use of a “blast mast” that can be draped over blast holes in advance of initiation and following loading. These are highly effective in managing fly rock and if employed correctly with considered blast design would effectively mitigate the risk of the fly rock hitting or damaging the existing dam structure.

The excavated slopes of the dry well will be supported by utilising rock bolts, drape rockfall mesh and shotcrete to mitigate the risk of rockfalls during construction or instability, these will be designed by suitably experienced engineering geologists in the field in response to the encountered ground conditions from a standardised typical design. Surface water runoff that is not intercepted at the slope crest and seepage from the rock slope would be directed to the sump-pump well and then pumped out from the construction area through appropriate treatment facility to maintain the “dry well”.

The excavated material will be disposed-off, either by transporting it away to a designated spoil area or placed on the Cruachan reservoir bed in the dead storage area, away and below the intake invert level.

In Phase 5, the intake structure will be constructed. The intake structure is a reinforced concrete structure with a hydraulically favourable bell mouth entrance and a central vertical pier to minimise head loss in either direction. Depending on the results of hydraulic model studies during final design, an anti-vortex screens may be fitted. The trash rack and intake gates grooves installed with hydro-mechanical embedment. A hoisting arrangement to operate intake gates will be erected at the intake deck level. At this stage, the track racks and intake gates can be lowered.

When the intake structure is completed, the piled cofferdam will be removed. A planned dewatering of the Cruachan reservoir will be undertaken to facilitate the excavation of the natural cofferdam and create an approach channel to the new intake structure.

Stantec

Memo

To:	Alexa Martin	Prepared by:	Sandip Shinde
Client:	Drax Cruachan Expansion	Checked by:	James Weddle
Project:	Cruachan Expansion Project	Reviewed by:	Craig Scott
Reference:	Access Tunnels connecting Powerhouse and MAT	Date:	December 13, 2022

1. Purpose of this Memorandum

The existing Ben Cruachan Hydro Electric Scheme Turbine Hall (LB51688) is a Category A listed structure as designated by Historic Environment Scotland since 11th February 2011. The existing scheme is of regional importance and was built by North of Scotland Hydro Electric Board (NoSHEB) post war and is the first example of a pumped storage hydroelectric scheme in Britain by James Williamson and Partners. The Turbine Hall contains several 1960's design features, including the timber mural by Elizabeth Faulkner. The Main Access Tunnel (MAT) is largely cut rock surface with local 20th century rock support such as shotcrete and rock anchors.

This technical memorandum discusses preliminary methodology envisaged to excavate the proposed access tunnels and how the existing structures will be protected during construction.

2. Access Tunnels to Existing Turbine Hall and Main Access Tunnel

There are two proposed access tunnels; one will connect the existing and newly proposed turbine halls, and the other will connect the existing and newly proposed main access tunnels (MAT). These access tunnels will provide operational flexibility and a safe access and emergency egress out of both power stations.

Within the existing Cruachan turbine hall, the new access will be located on the north-eastern face of an end wall of the turbine hall cavern, below the existing visitors viewing gallery. It will measure approximately 3.5m x 3.5m in size in a horseshoe shape profile. The access tunnel connecting the existing and proposed MATs will be located at about 775m from the entrance into the tunnel on its eastern face and will measure around 4.5m x 4.5m in size. It would also be blasted in a horseshoe shape profile. The layouts showing the proposed access tunnels to the transformer hall and main access tunnel are shown in **Figure 1** and **Figure 2**.

Figure 1: Transformer Wall and Proposed Access Tunnel

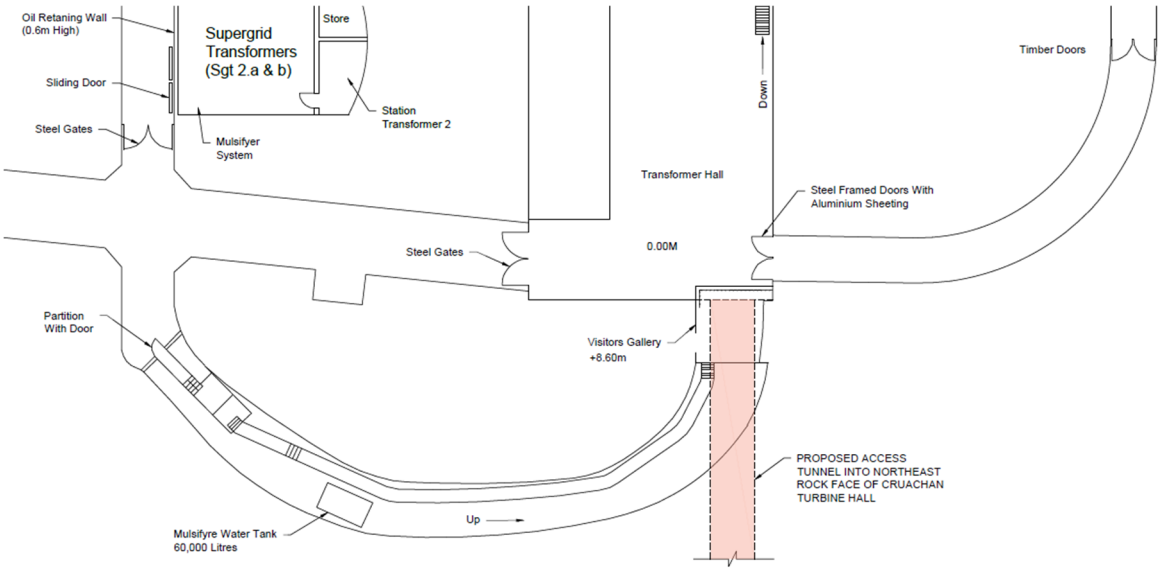
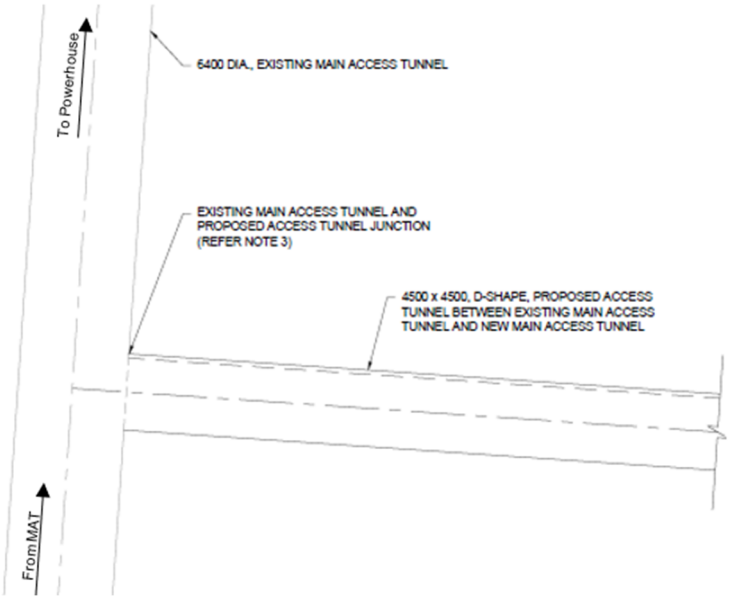


Figure 2: Proposed Access Tunnel to MAT



3. Rock Excavation of Turbine Hall and MAT Access Tunnels

The proposed access tunnels will be excavated from the new powerhouse cavern and MAT. They will stop in the vicinity of the existing structures. The last stretch of the access tunnels will be excavated by using either of the below two construction methodologies.

- Controlled blasting method, and
- Non-blasting methods

The controlled blasting construction methodology will involve the drilling of a pattern of boreholes, loaded with explosives which are sequentially individually blasted around 8 milliseconds apart in “rounds” (short sections of the tunnel) commencing with a test blast of lightly loaded explosives and adequately delayed to mitigate Peak Particle Velocities (PPV- vibration), keep air overpressure within acceptable levels and limit dust. This excavation methodology was considered as a known practicable worst-case solution and presented to Heritage Environment Scotland (HES) and Argyll and Bute Council (ABC) on 31st August 2022.

The use of non-explosive excavation will be explored during the next phase of studies.

3.1 Controlled Blasting Method

The rock excavation by controlled blasting is a widely adopted method for the excavation of rock for hydroelectric power schemes. Over two centuries blasting has been undertaken for mines and civil infrastructure. Blasting has become progressively more controllable, with the fairly recent development of precision detonation using programable delays and careful design of blasts with software, very low levels of vibration, overpressure and dust can be achieved from small, staged blasts, utilising minimal instantaneous charges (explosive weights) which break and fracture the rock with minimal displacement in a controllable manner within very close proximity to extremely sensitive structures.

Controlled blasting could be feasibly employed to undertake the rock excavation and breakthrough of both the turbine hall and access tunnel excavation. Stantec envisage this would be undertaken in a phased manner comprising a total of Seven (7) stages to form the tunnel and install rock support. The seven stages are:

- Stage 1: Installation of a box structure with ventilation duct on the face of the proposed access tunnel
- Stage 2: Drilling and installation of temporary rope anchors, fully grouted-post tensioned rock bolts (around the proposed tunnel portal), and drilling for the pilot tunnel
- Stage 3: Charging of the pilot tunnel drill holes, installation of the blasting mat, closing of the doors of the box structure, and undertaking the blasting
- Stage 4: Ventilation of the blast smoke, removing the blast mat, mucking of the pilot tunnel, and drilling for enlarging the access tunnel.
- Stage 5: Charging of the access tunnel enlarging drill holes, installation of the blast mat, closing of the doors for the box structure, and undertaking the blast
- Stage 6: Ventilation of the blast smoke, removing the blast mat, mucking for the tunnel, installation of rock supports including the steel rib supports.
- Stage 7: Drilling for the Segment 2 pilot tunnel and repeating Stage 2 to Stage 6 for the subsequent extension of the access tunnel.

The construction stages were detailed through drawings, 331201086/001/C/0200, 31201086/001/C/0201, and 331201086/001/C/0202, enclosed under Appendix A of this memorandum. It should be highlighted that the Cruachan station will be fully evacuated ahead of any blasting and undertaken when the pump-turbines are not in operation.

The construction staging of the breakthrough to the MAT is envisaged to comprise of fewer stages as the nearest sensitive structures are some distance from the blasting. The final break through blast is anticipated to comprise of a shorter round drilled from the new station end of the advancing tunnel. It is anticipated that rock support and blast matting will be bolted to the face of the eastern shoulder to the at the anticipated point of breakthrough. The matting combined with a non-woven geotextile tightly bolted to the face is anticipated to contain fly rock and dust. Blast vibrations will be monitored at sensitive infrastructure, however given the distance from the turbine hall it is anticipated that these would be below tolerances without the need for further mitigative measures. Prior to blasting, ventilation fans and air ducting should be advanced to the position of the breakthrough blast to extract dust and fumes out of the portal and avoid accumulations in the operational station.

Ventilation will be installed at the breakthrough of the portal in the existing turbine hall. Stantec propose isolating the working area to maximise the effectiveness of the ventilation by installing temporary box structure enclosures. The box enclosures will be sized considering working space requirements and the movement of the construction equipment. A ventilation arrangement provided at the roof of the box structure will aid in providing ventilation and evacuation of the blast smoke and dust. The ventilation duct (bagging) will be routed along the face of the existing MAT and will exit near the entry portal of the existing MAT. The enclosure will also assist in the control of fly rock and attenuation of air overpressure shockwaves from the blast.

The blasting will be designed by the contractor’s specialist blast designer, and all the blast designs will be reviewed by the owner’s engineer. The proposed blast design will ensure that the ground vibrations and air overpressure remain within the acceptable thresholds. A series of test blasts will be undertaken under the direction of a specialist blasting contractor, and the results of the test blast will be reviewed and approved by the owner’s engineer.

Subject to the results of test blasting and the attenuation of ground vibration and air overpressure, Stantec anticipates that some mitigation might be necessary and are likely to be a combination of reduction of the maximum instantaneous charge, decking of explosive, electrically programmable delays, suitable stemming and matting and attenuation of the blast to mitigate overpressure. Fly rock would also be closely managed and controlled from blasting and may include measures utilised by the contractor such as the use of a “blast mast” and geotextiles that can be draped over blast holes in advance of initiation and following loading and installed as baffles also within the tunnel. These are highly effective in managing material projected from the blast.

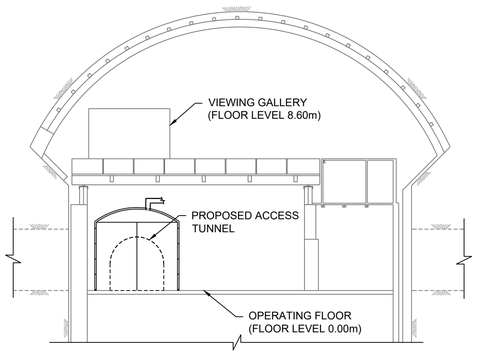
To limit blast-induced vibrations, the access tunnel will be excavated in short segments and by excavating the pilot tunnels. The pilot tunnel excavation will be followed by expanding the segment to full access tunnel size. The subsequent segments will be excavated upon installation of the rock supports for the preceding segment. A blast monitoring will be undertaken by the contractor at critical infrastructure in order to ensure that the peak particle velocity and overpressure does not exceed thresholds established by the owner's engineer. As a precautionary measure it may be necessary to temporarily remove windows within the control room and viewing galley areas as these are particularly vulnerable to very low vibration thresholds and air overpressure.

The excavated faces of the tunnels will be supported by rock bolts, rock anchors, shotcrete, and steel ribs to mitigate against localised changes in the stress regime and instability. The length and spacing of the rock bolts, rock anchors, and supporting steel ribs will be designed by suitably experienced engineering geologists following three-dimensional stress analysis of the proposed new opening within the turbine hall and also in the field in response to the encountered ground conditions from a standardised typical design.

Upon construction of the portal and tunnelling to the desired distance from the access tunnel portals on the existing turbine hall and MAT side, the temporary box enclosures removed, and portal rock faces will be reinstated along with windows within the turbine hall and viewing galley. Appropriate fire-rated doors will be installed at the access tunnel portals on the existing turbine hall and MAT side.

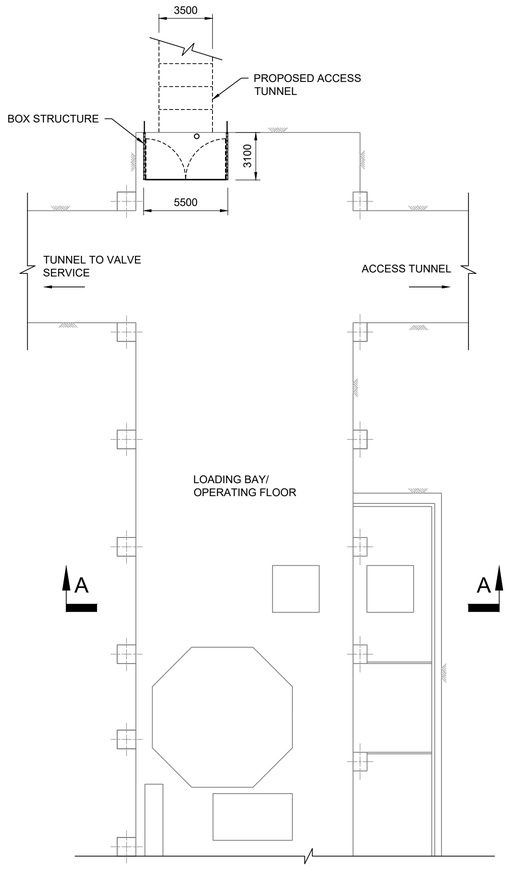
APPENDIX A – DRAWINGS

Drawing No.	Drawing Title
331201086/001/C/0200	Northeast Wall Access Tunnel Construction Stages - Concept
331201086/001/C/0201	Northeast Wall Access Tunnel Construction Stages - Concept
331201086/001/C/0202	Northeast Wall Access Tunnel Construction Stages - Concept
331201086/001/C/0203	Layout of Underground Tunnels and Access Roads Location of Proposed Access Tunnel
331201086/001/C/0204	Turbine Hall - Northeast Rock Face Front Elevation Location of Proposed Access Tunnel
331201086/001/C/0210	Proposed Access Tunnel for Connecting Existing and Proposed Main Access Tunnels General Arrangement



SECTION A-A

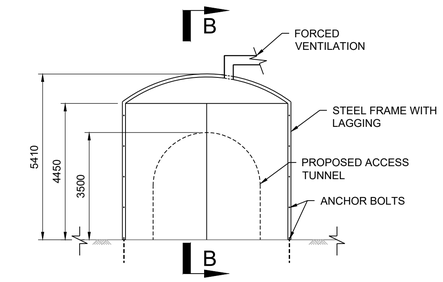
SCALE 1:200



OPERATING FLOOR
PLAN AT 0.00m

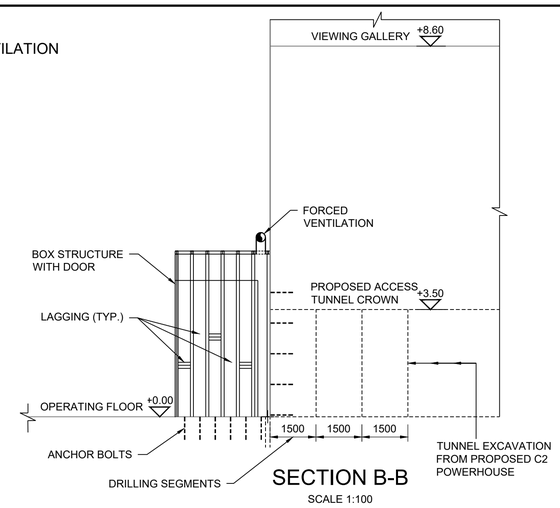
SCALE 1:200

STAGE 1: INSTALLATION OF BOX STRUCTURE WITH VENTILATION DUCT AT FACE OF PROPOSED ACCESS TUNNEL.



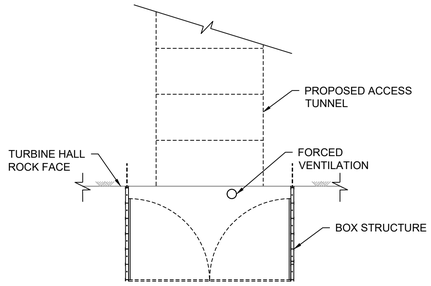
FRONT ELEVATION

SCALE 1:100



SECTION B-B

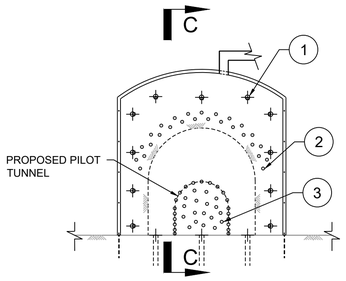
SCALE 1:100



PLAN

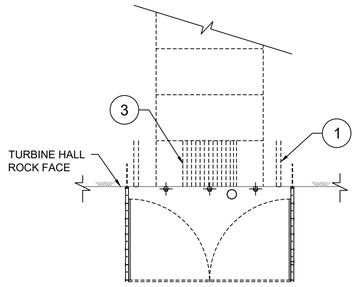
SCALE 1:100

STAGE 2: DRILLING AND INSTALLATION OF TEMPORARY ROPE ANCHORS, FULLY GROUTED-POST TENSIONED ROCK BOLTS, DRILLING FOR PILOT TUNNEL.



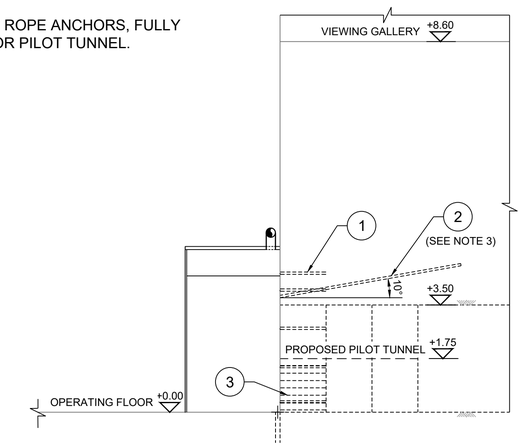
FRONT ELEVATION

SCALE 1:100



PLAN

SCALE 1:100



SECTION C-C

SCALE 1:100

ITEM DESCRIPTION	
ITEM	DESCRIPTION
1	TEMPORARY ROPE ANCHORS WITH EYE NUT AND SHACKLES
2	FULLY GROUTED POST-TENSIONED ROCK BOLTS
3	ACCESS TUNNEL DRILL HOLES (TYP.)

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES UNLESS SHOWN OTHERWISE.
2. THIS IS A CONCEPT DRAWING TO ILLUSTRATE THE CONSTRUCTION STAGES. ALL DIMENSIONS AND ELEVATIONS ARE APPROXIMATE AND WILL BE REVIEWED AND UPDATED AS PROJECT DESIGN STUDIES CONTINUE. ALL CONCEPTS, DETAILS, DIMENSIONS AND ELEVATIONS INDICATED ON THIS DRAWING WILL REQUIRE FURTHER REFINEMENT DURING A SUBSEQUENT DESIGN PHASE.
3. THE LENGTH AND SPACING OF THE ROCK BOLTS, ROCK ANCHORS, AND STEEL RIBS SHALL BE CONFIRMED DURING THE NEXT PHASE OF THE STUDIES BASED ON GEOTECHNICAL INVESTIGATION AND ROCK STABILITY ANALYSIS
4. BLASTING SHALL BE DESIGNED BY THE CONTRACTORS SPECIALIST BLAST DESIGNER AND UNDERTAKEN TO MINIMIZE GROUND VIBRATION (PEAK PARTICLE VELOCITY) AND FLY ROCK AND DUST.
5. ALL BLAST DESIGN SHALL BE REVIEWED BY THE OWNERS ENGINEER.
6. TEST BLASTING SHALL BE UNDERTAKEN BY THE CONTRACTOR FOR ALL BLAST DESIGNS AND SHALL BE REVIEWED BY THE OWNERS AND ENGINEER.
7. BLAST MONITORING SHALL BE UNDERTAKEN BY THE CONTRACTOR AT CRITICAL INFRASTRUCTURE IN ORDER TO ENSURE PPV DO NOT EXCEED THRESHOLDS ESTABLISHED BY OWNERS ENGINEER.
8. ROCK SUPPORT GROUND CONTROL MEASURES SHALL BE DESIGNED SUBJECT TO GROUND INVESTIGATIONS AND ENCOUNTERED GROUND CONDITIONS.

LEGEND

X → ITEM

SCALE 1 : 100

m1 0 10m

SCALE 1 : 200

m10 0 10m

CURRENT VERSION INFORMATION

DATE	DRWN	CHKD	REVD	VER	REASON FOR ISSUE
17.08.22	RA	SS	JW	A	FOR INFORMATION

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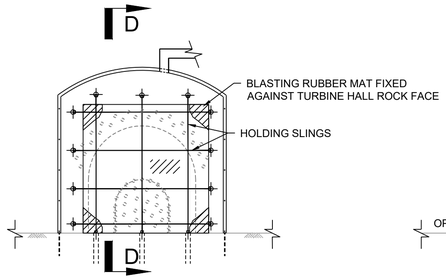
NORTHEAST WALL ACCESS TUNNEL
CONSTRUCTION STAGES - CONCEPT

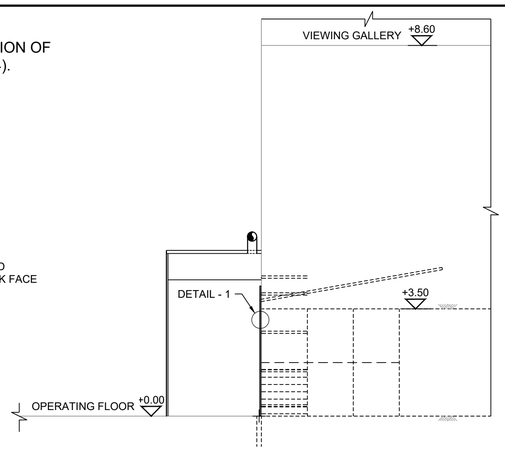
CONTRACT NO.	SCALE	MASTER SIZE
001	AS SHOWN	A1

DRAWING NO.	VERSION
331201086/001/C/0200	A

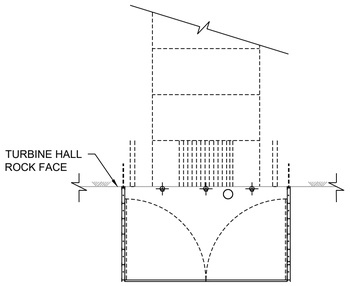
STAGE 3: CHARGING OF PILOT TUNNEL DRILL HOLES, INSTALLATION OF BLASTING MAT, CLOSING OF MAIN DOOR, BLASTING (SEE NOTE 4).



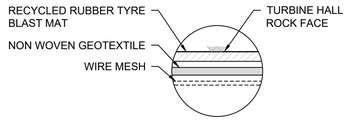
FRONT ELEVATION
SCALE 1:100



SECTION D-D
SCALE 1:100

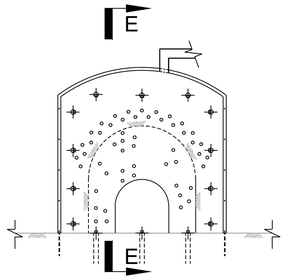


PLAN
SCALE 1:100



DETAIL- 1
SCALE NTS

STAGE 4: VENTILATION OF BLAST SMOKE, REMOVAL OF BLAST MAT, MUCKING OF PILOT TUNNEL, AND DRILLING FOR ENLARGING THE ACCESS TUNNEL.



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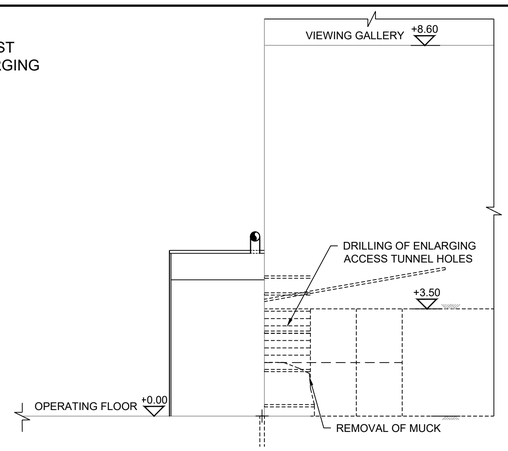
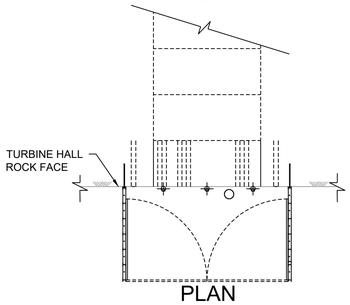
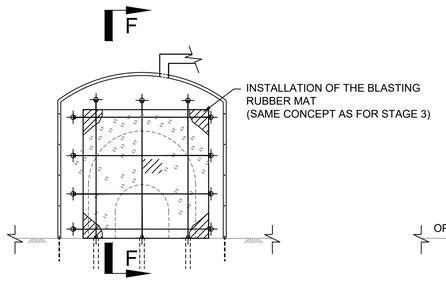


SECTION E-E
SCALE 1:100



PLAN
SCALE 1:100

STAGE 5: CHARGING OF THE ENLARGING DRILL HOLES, INSTALLATION OF BLASTING MAT, CLOSING OF MAIN DOOR, BLASTING.



FRONT ELEVATION
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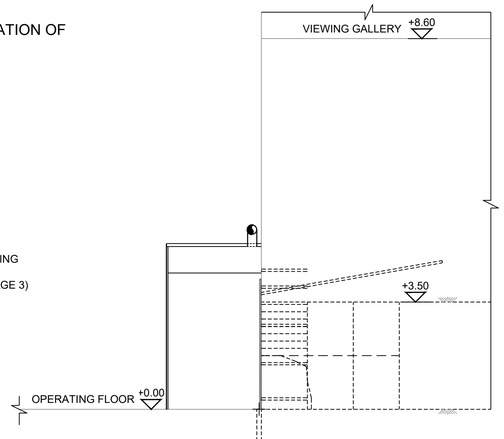
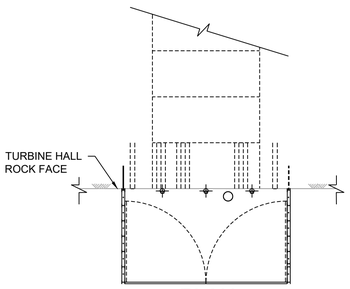
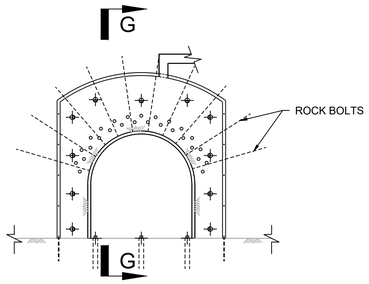


SECTION F-F
SCALE 1:100

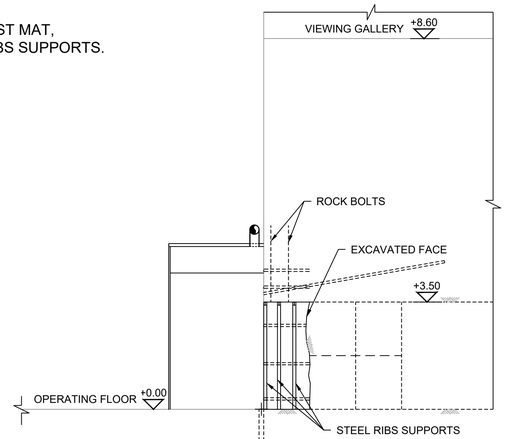


PLAN
SCALE 1:100

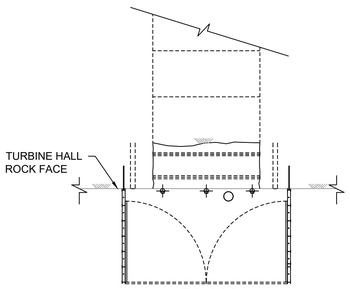
STAGE 6: VENTILATION OF BLAST SMOKE, REMOVAL OF BLAST MAT, MUCKING, INSTALATION OF ROCK SUPPORTS AND STEEL RIBS SUPPORTS.



FRONT ELEVATION
SCALE 1:100



SECTION G-G
SCALE 1:100



PLAN
SCALE 1:100

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES UNLESS SHOWN OTHERWISE.
2. THIS IS A CONCEPT DRAWING TO ILLUSTRATE THE CONSTRUCTION STAGES. ALL DIMENSIONS AND ELEVATIONS ARE APPROXIMATE AND WILL BE REVIEWED AND UPDATED AS PROJECT DESIGN STUDIES CONTINUE. ALL CONCEPTS, DETAILS, DIMENSIONS AND ELEVATIONS INDICATED ON THIS DRAWING WILL REQUIRE FURTHER REFINEMENT DURING A SUBSEQUENT DESIGN PHASE.
3. THE LENGTH AND SPACING OF THE ROCK BOLTS, ROCK ANCHORS, AND STEEL RIBS SHALL BE CONFIRMED DURING THE NEXT PHASE OF THE STUDIES BASED ON GEOTECHNICAL INVESTIGATION AND ROCK STABILITY ANALYSIS
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LEGEND

X → ITEM

SCALE 1 : 100

m1 0 10m

CURRENT VERSION INFORMATION

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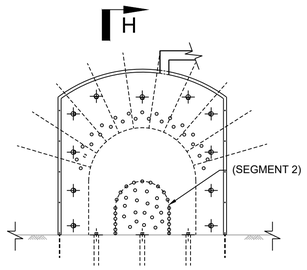
DRAX CRUACHAN EXPANSION LTD
CRUACHAN 2

NORTHEAST WALL ACCESS TUNNEL
CONSTRUCTION STAGES - CONCEPT

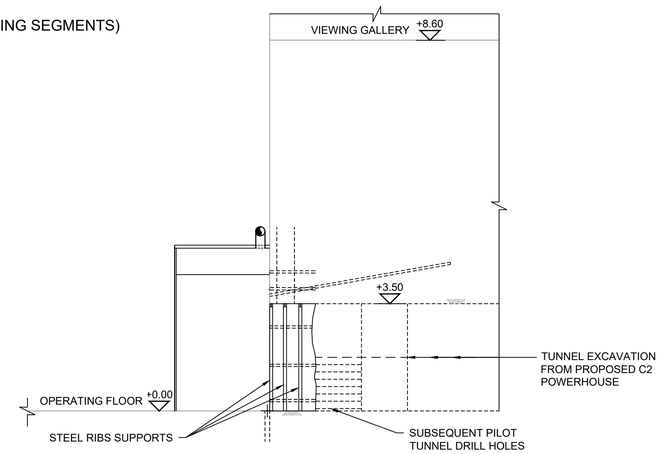
CONTRACT NO.	SCALE	MASTER SIZE
001	1:100	A1

DRAWING NO.	VERSION
331201086/001/C/0201	A

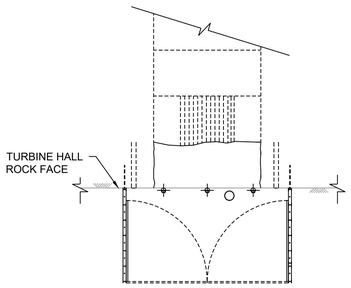
STAGE 7: DRILLING FOR THE PILOT TUNNEL.
(REPEAT OF STAGE 2 TO STAGE 6 FOR SUBSEQUENT DRILLING SEGMENTS)



FRONT ELEVATION
SCALE 1:100



SECTION H-H
SCALE 1:100



PLAN
SCALE 1:100

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES UNLESS SHOWN OTHERWISE.
2. THIS IS A CONCEPT DRAWING TO ILLUSTRATE THE CONSTRUCTION STAGES. ALL DIMENSIONS AND ELEVATIONS ARE APPROXIMATE AND WILL BE REVIEWED AND UPDATED AS PROJECT DESIGN STUDIES CONTINUE. ALL CONCEPTS, DETAILS, DIMENSIONS AND ELEVATIONS INDICATED ON THIS DRAWING WILL REQUIRE FURTHER REFINEMENT DURING A SUBSEQUENT DESIGN PHASE.
3. THE LENGTH AND SPACING OF THE ROCK BOLTS, ROCK ANCHORS, AND STEEL RIBS SHALL BE CONFIRMED DURING THE NEXT PHASE OF THE STUDIES BASED ON GEOTECHNICAL INVESTIGATION AND ROCK STABILITY ANALYSIS
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LEGEND

X → ITEM

SCALE 1 : 100

m1 0 10m

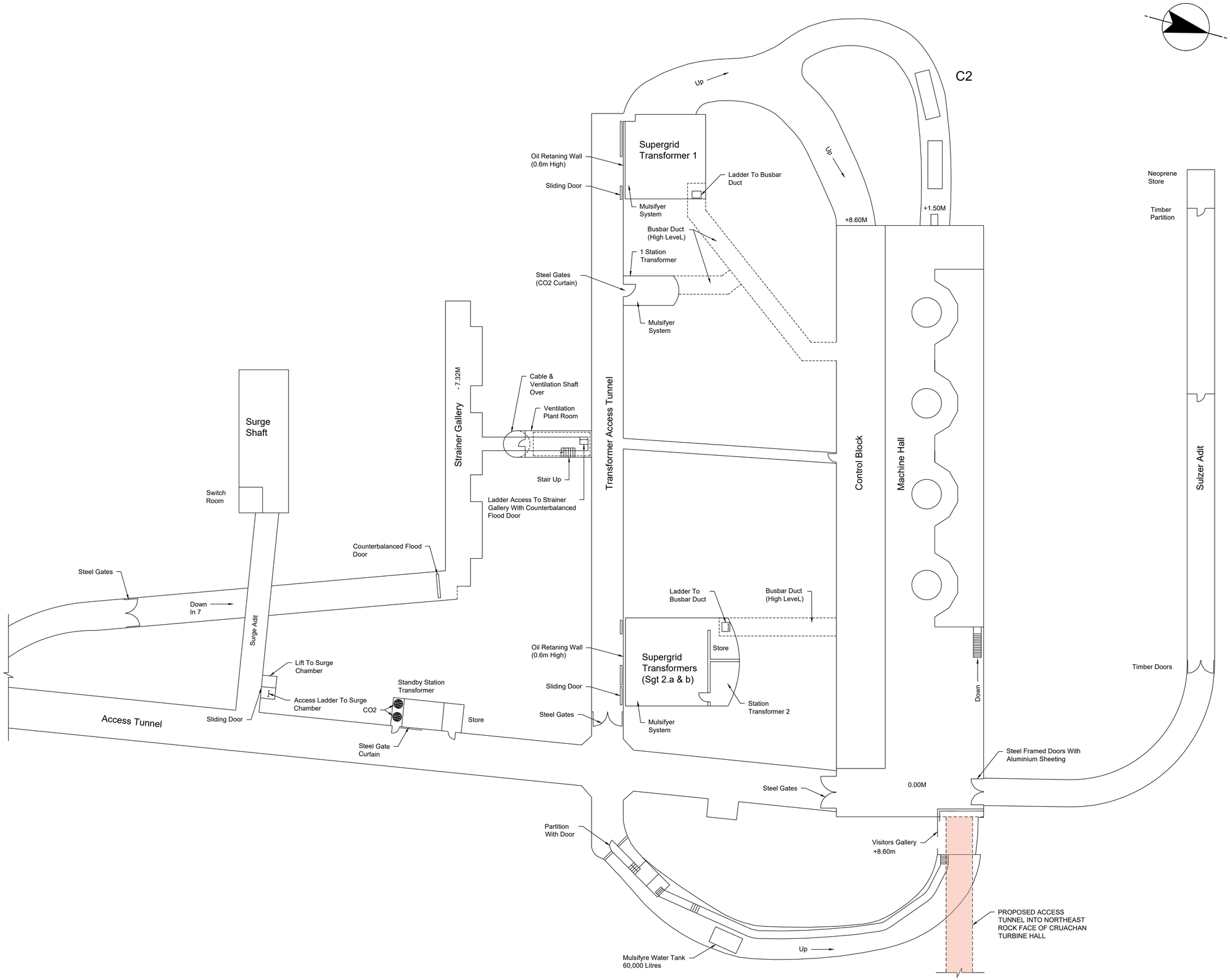
CURRENT VERSION INFORMATION

DATE	DRWN	CHKD	REVD	VER	REASON FOR ISSUE
17.08.22	RA	SS	JW	A	FOR INFORMATION

DRAX CRUACHAN EXPANSION LTD
CRUACHAN 2

NORTHEAST WALL ACCESS TUNNEL
CONSTRUCTION STAGES - CONCEPT

CONTRACT NO.	SCALE	MASTER SIZE
01	1:100	A1
DRAWING NO. 331201086/01/C/0202		VERSION A



CRUACHAN (EXISTING) - LAYOUT OF UNDERGROUND TUNNELS AND ACCESS ROADS

SCALE NTS

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES UNLESS SHOWN OTHERWISE.
2. THIS DRAWING IS REPRODUCED FROM THE RECORD DRAWING.

REFERENCES

331201086/001/C/0200 - NORTHEAST WALL ACCESS TUNNEL CONSTRUCTION STAGE - CONCEPT.
331201086/001/C/0201- NORTHEAST WALL ACCESS TUNNEL CONSTRUCTION STAGE - CONCEPT.
331201086/001/C/0202- NORTHEAST WALL ACCESS TUNNEL CONSTRUCTION STAGE - CONCEPT.
331201086/001/C/0204 - CRUACHAN (EXISTING) PUMPED STORAGE HYDRO TURBINE HALL - NORTHEAST ROCK FACE FRONT ELEVATION. LOCATION OF PROPOSED ACCESS TUNNEL.
CRU-TR-02/15 - RECORD DRAWING CRUACHAN (EXISTING) - LAYOUT OF UNDERGROUND TUNNELS AND ACCESS ROADS.

CURRENT VERSION INFORMATION

DATE	DRWN	CHKD	REVD	VER	REASON FOR ISSUE
22.08.22	RA	SS	NM	A	FOR INFORMATION

DRAX CRUACHAN EXPANSION LTD
CRUACHAN 2

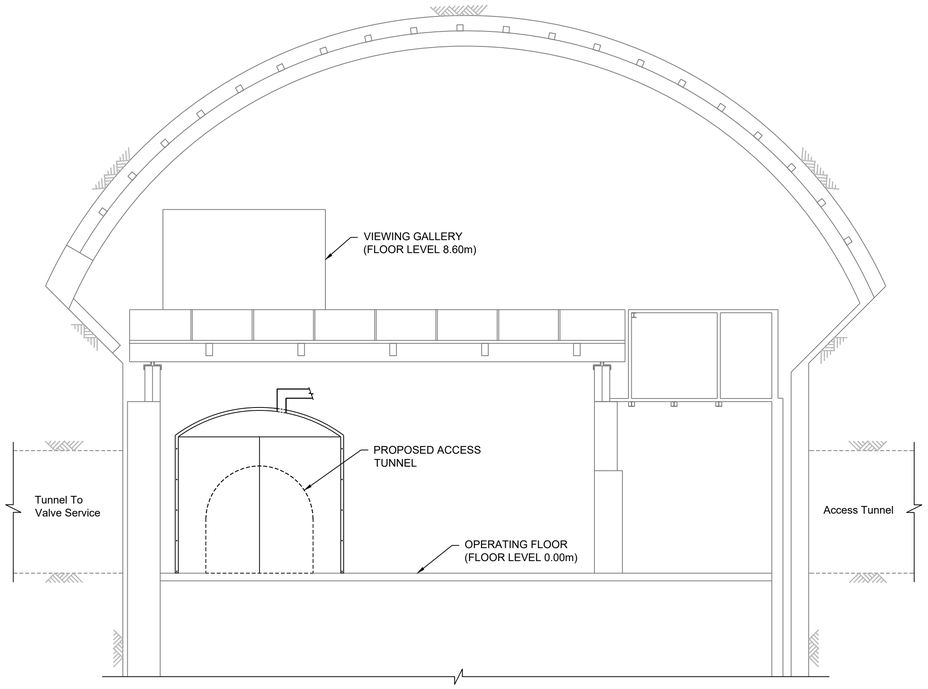
CRUACHAN (EXISTING) PUMPED STORAGE HYDRO
LAYOUT OF UNDERGROUND TUNNELS
AND ACCESS ROADS
LOCATION OF PROPOSED ACCESS TUNNEL

drax

Stantec

CONTRACT NO.	SCALE	MASTER SIZE
001	NOT TO SCALE	A1

DRAWING NO.	VERSION
331201086/001/C/0203	A



FRONT ELEVATION
TURBINE HALL - NORTHEAST ROCK FACE
SCALE 1:100

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES UNLESS SHOWN OTHERWISE.
2. THIS DRAWING IS REPRODUCED FROM THE RECORD DRAWING.

REFERENCES

331201086/001/C/0200 - NORTHEAST WALL
ACCESS TUNNEL CONSTRUCTION STAGE - CONCEPT.
331201086/001/C/0201 - NORTHEAST WALL
ACCESS TUNNEL CONSTRUCTION STAGE - CONCEPT.
331201086/001/C/0202 - NORTHEAST WALL
ACCESS TUNNEL CONSTRUCTION STAGE - CONCEPT.
331201086/001/C/0203 - CRUACHAN (EXISTING) PUMPED STORAGE HYDRO
LAYOUT OF UNDERGROUND TUNNELS AND ACCESS ROADS.
LOCATION OF PROPOSED ACCESS TUNNEL.
CRU-TR-02/15 - RECORD DRAWING
CRUACHAN (EXISTING) -
LAYOUT OF UNDERGROUND TUNNELS AND ACCESS ROADS..

SCALE 1 : 100
m1 0 10m

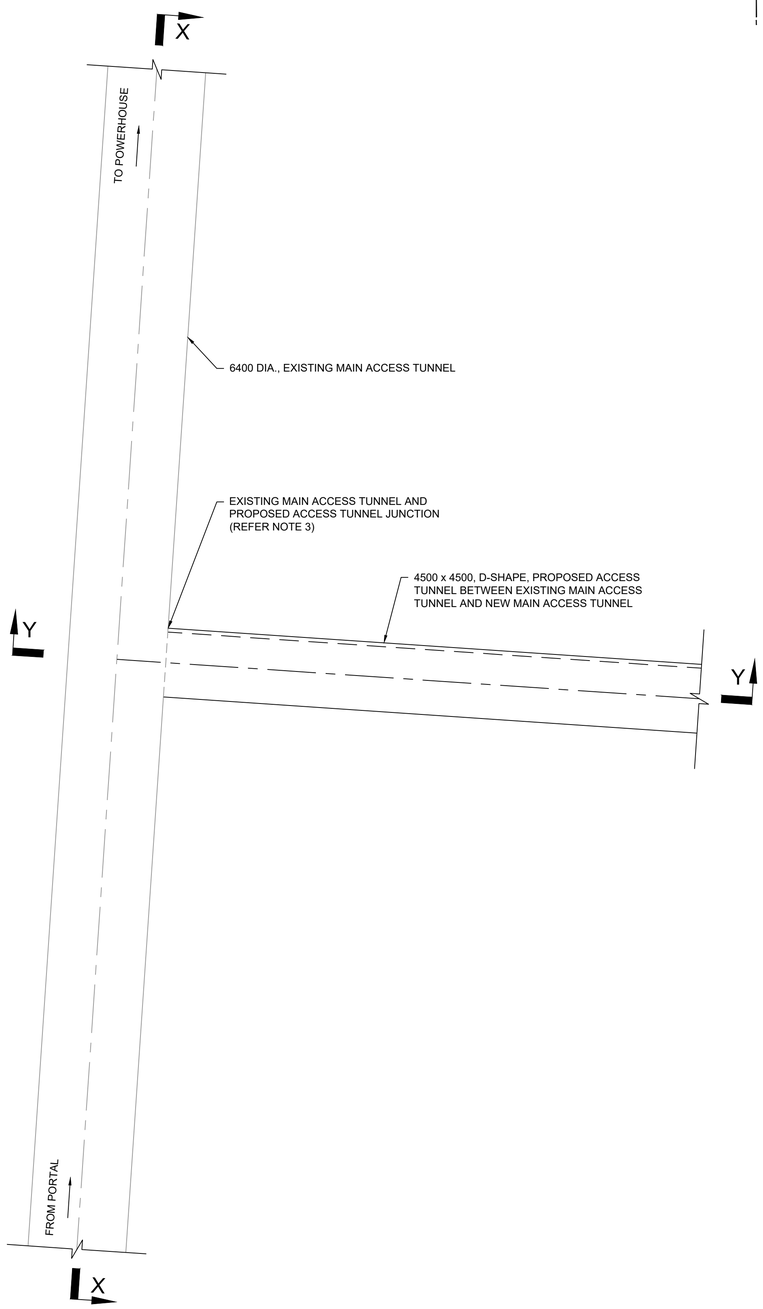
CURRENT VERSION INFORMATION

DATE	DRWN	CHKD	REVD	VER	REASON FOR ISSUE
22.08.22	RA	SS	NM	A	FOR INFORMATION

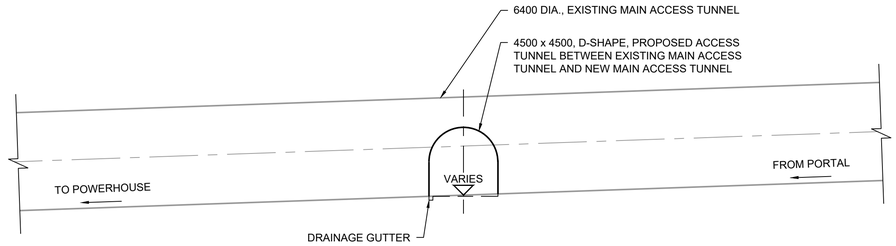
DRAX CRUACHAN EXPANSION LTD
CRUACHAN 2
CRUACHAN (EXISTING) PUMPED STORAGE HYDRO
TURBINE HALL - NORTHEAST ROCK FACE
FRONT ELEVATION
LOCATION OF PROPOSED ACCESS TUNNEL

CONTRACT NO.	SCALE	MASTER SIZE
001	1:100	A1

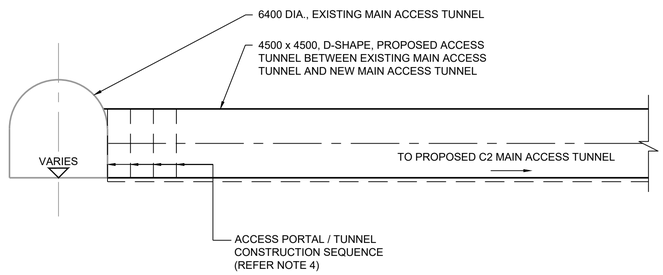
DRAWING NO.	VERSION
331201086/001/C/0204	A



PLAN
EXISTING MAIN ACCESS TUNNEL AND PROPOSED
CONNECTING ACCESS TUNNEL
SCALE 1:200



SECTION X-X
SCALE 1:200



SECTION Y-Y
SCALE 1:200

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES UNLESS SHOWN OTHERWISE.
2. THIS IS A CONCEPT DRAWING TO ILLUSTRATE THE CONCEPT ARRANGEMENT FOR THE PROPOSED ACCESS TUNNEL CONNECTING THE EXISTING MAIN ACCESS TUNNEL AND PROPOSED ACCESS TUNNEL. ALL DIMENSIONS AND ELEVATIONS ARE APPROXIMATE AND WILL BE REVIEWED AND UPDATED AS PROJECT DESIGN STUDIES CONTINUE.
3. THE EXISTING MAIN ACCESS TUNNEL AND PROPOSED ACCESS TUNNEL JUNCTION WILL BE REFINED DURING NEXT PHASE OF STUDIES.
4. REFER SEPARATE DRAWINGS FOR ACCESS TUNNEL PORTAL CONSTRUCTION SEQUENCE (DRAWING No. 331201086/01/C/0200 TO 331201086/01/C/0202).
5. ROCK SUPPORT GROUND CONTROL MEASURES SHALL BE DESIGNED AND WILL SUBJECT TO GROUND INVESTIGATIONS AND ENCOUNTERED GROUND CONDITIONS.
6. THE MAIN ACCESS TUNNEL ROCK FACE AT THE PROPOSED ACCESS TUNNEL JUNCTION SHALL BE ADEQUTELY TREATED WITH ROCK SUPPORTS BEFORE UNDERTAKING BLASTING.

REFERENCE DRAWING

331201086/01/C/0961	4 x 150 MW GENERAL ARRANGEMENT PLAN
331201086/01/C/0022	2 x 300 MW GENERAL ARRANGEMENT PLAN
331201086/01/C/0200	NORTHEAST WALL ACCESS TUNNEL CONSTRUCTION STAGES - CONCEPT
331201086/01/C/0201	NORTHEAST WALL ACCESS TUNNEL CONSTRUCTION STAGES - CONCEPT
331201086/01/C/0202	NORTHEAST WALL ACCESS TUNNEL CONSTRUCTION STAGES - CONCEPT

SCALE 1 : 200
m10 0 10m

CURRENT VERSION INFORMATION

DATE	DRWN	CHKD	REVD	VER	REASON FOR ISSUE
22.11.22	SRB	SS	CS	A	FOR INFORMATION

DRAX CRUACHAN EXPANSION LTD
CRUACHAN 2
PROPOSED ACCESS TUNNEL FOR CONNECTING
EXISTING AND PROPOSED MAIN ACCESS TUNNELS
GENERAL ARRANGEMENT

..\ams37267\Drax Logo.png

Stantec

CONTRACT NO.	SCALE	MASTER SIZE
001	1 : 200	A1

DRAWING NO.	VERSION
331201086/01/C/0210	A

Further Environmental Information

Appendix 3 Ecology

To whom it may concern
The Energy Consents Unit

(by email)

15 August 2022

Dear Sir/Madam

Re: Application for Consent Under Section 36 Of The Electricity Act 1989 for Construction and Operation of the Cruachan Expansion Project – Further Information Requested by NatureScot

On 05 July 2022, NatureScot provided a written consultee response to the above application, seeking further information in relation to the Loch Etive Woods Special Area of Conservation (SAC) and the Coille Leitire Site of Special Scientific Interest (SSSI). Specific queries were raised with regards to the calculated hectarage of habitat loss within these two designated sites that could be attributed to the Development.

On 20 July 2022, an online Microsoft Teams meeting was held between Applied Ecology Ltd and NatureScot, to "walk through" the footprint of the above Development and to demonstrate how the direct impact calculations had been derived.

Following that meeting, it was agreed that a written statement describing how the calculations had been made would be prepared, including where possible illustration of this. This information forms the main content of this letter.

1. The need for widening

The design rational for the access track up to Cruachan Dam is to widen into the available downslope verge where practical, to enable a 4.8 m wide track (sufficient to allow a car to pass a HGV) and where possible provide 7.3 m wide passing places for two HGVs to pass. Early in the project, ecological advice was given to the design team that any widening of this track as part of the Development should occur only at notable pinch points, and only on the uphill (northern) side of the existing track, as this was the non-designated side. Although it was possible to restrict the widening to just those locations where it was essential, upslope widening is not being proposed as the track is already situated within a rock cutting, and the existing rock slope already displays evidence of having stability issues (structural buttresses/rock netting have previously been installed in some locations). Any further widening would create a substantial cut, likely to require a structural solution, and this will result in excessive land-take in the context of the minimal horizontal gain needed for track widening.

A traffic management system (TMS) is now not being considered for the track, given the need to widen to the 4.8 m minimum running width, and the operational logistics associated with the lengths of track for which a TMS would theoretically need to be in place if this widening did not occur.

Cont./

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/cont.

2. Location of impact

The location of the SAC and SSSI in relation to the proposed Development is shown in Figure 2.1 of Technical Appendix 8.1 accompanying the EIAR. The current access track to Cruachan Dam skirts just under 1.5 km of the northern edge of the designated site.

Figure 1 shows a stretch of track where there will, and will not, be widening, using an overlay of the total footprint (pink outline) on the Scottish EUNIS habitat map. The grey shading represents the existing track. This shows how only a proportion of the 1.5 km along the northern edge of the SAC/SSSI will be affected by the widening.

3. Impacts on the SAC/SSSI

The location of the lengths of the access track needing to be widened relative to the SAC/SSSI boundary (as provided in the NatureScot GIS shapefiles), can be categorised into three scenarios:

(a) Where the widening does not encroach on the SAC/SSSI boundary.
(b) Where the widening encroaches on the SAC/SSSI boundary but does not include wooded habitats.
(c) Where the SAC/SSSI boundary already includes the existing access track and therefore by default is included in the calculations of the footprint.

These three scenarios are illustrated in **Figures 2, 3** and **4** respectively.

4. Quantifying impacts

When the limited sections of widening shown in Figures 2-4 are aggregated, their total area is 1280.59 m^2, i.e. just under 0.13 ha. This was calculated by summing all areas where the footprint of the works overlapped with the SAC/SSSI boundary (as supplied by NatureScot), regardless of whether or not the ground is actually currently access track (Scenario C above). A summary of the location of these areas are shown in **Figure 5**. As that 0.13 ha includes ground that is already hard standing (Scenario c), it in itself is an overestimate of the loss of semi-natural habitats.

5. Ancient Woodland

During the meeting on 20 July 2022, a short discussion was also had regarding similar GIS-based issues surrounding the calculation of impacts on ancient woodland. There will be a small area of ancient woodland ground directly affected by the proposed Development, but as with Scenario c above, the boundaries given for woodland areas within the Ancient Woodland Inventory (AWI) frequently include ground that has not been wooded for some time. At Cruachan, the AWI covers the existing access track (as well as other roads, tracks and powerline wayleaves) which is included in the Development footprint, and therefore the calculated loss for this Important Ecological Feature is an overestimate, possibly by up to 50 %. This is illustrated in **Figure 6**.

We hope that this additional information has been helpful, but please do not hesitate to get back to us if you have any further questions or queries. In particular, if you would like us to facilitate a site visit for you, do let us know.

Yours faithfully,

(by email)

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Glasgow G52 4RU
Company Registration Number: 05447247

Tel: 0141 585 6378
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Web: www.appliedecology.co.uk

Cont./

/cont.

Dr Rachel Hirst CEcol CEnv MCIEEM

Director (Scotland)
On behalf of Applied Ecology Ltd

rachel.hirst@appliedecology.co.uk

encs.: Figures 1-6.

Cruachan 2

Example of Targeted Widening

Site boundary

Development footprint

Existing habitats:

E1.71: Nardus stricta acid grasslands

E5.31: Sub-Atlantic bracken fields

G1.91: Oak/birch woodland

J4: Roads, tracks and hard standing

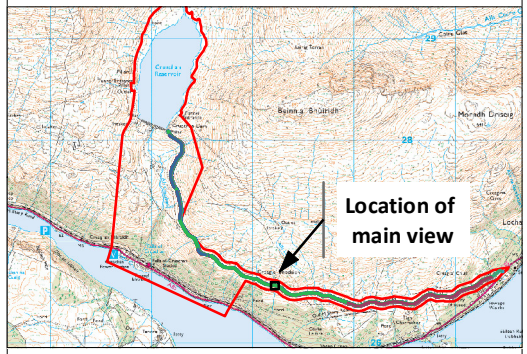


Figure 1

Map Scale @ A4: 1:400

Surveyed by: AEL	
Survey date: 2021	
Drawn by: RAH	
Checked by: DS	
Status: Final	

Applied Ecology Ltd

Cruachan 2

Example of Widening Affecting Non-SAC/SSSI Ground

Site boundary

Development footprint

SAC/SSSI boundary

Existing habitats:

E1.71: Nardus stricta acid grasslands

E5.31: Sub-Atlantic bracken fields

F4.22: Sub-Atlantic Calluna heaths

J4: Roads, tracks and hard standing

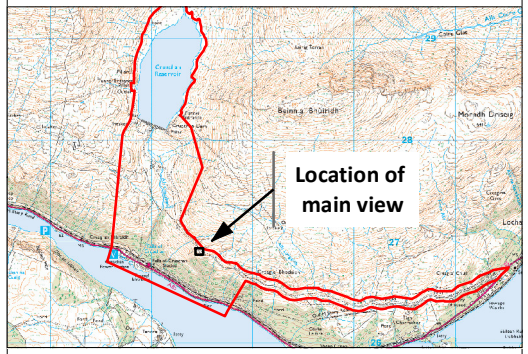


Figure 2

Map Scale @ A4: 1:400

Surveyed by: AEL	
Survey date: 2021	
Drawn by: RAH	
Checked by: DS	
Status: Final	

Applied Ecology Ltd

N

0 4 8 metres

Cruachan 2

Example of Widening Affecting Non-Wooded SAC/SSSI Ground

Site boundary

Development footprint

SAC/SSSI boundary

Existing habitats:

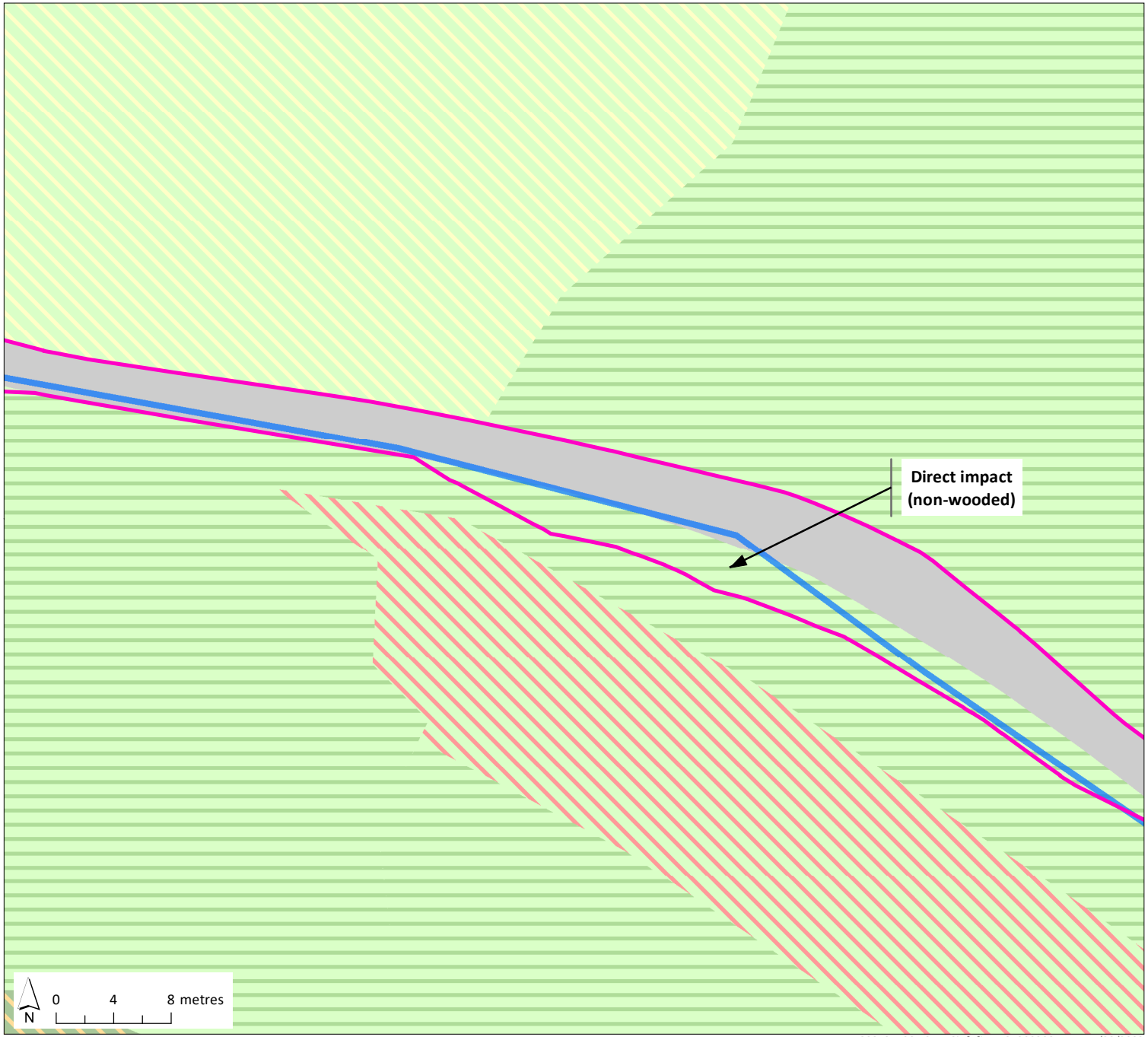
E1.71: Nardus stricta acid grasslands

E1.72#: Grass-heath

E5.31: Sub-Atlantic bracken fields

G1.91: Oak/birch woodland

J4: Roads, tracks and hard standing



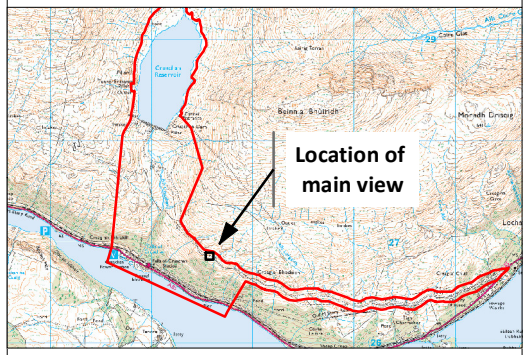


Figure 3

Map Scale @ A4: 1:400

Surveyed by: AEL	
Survey date: 2021	
Drawn by: RAH	
Checked by: DS	
Status: Final	

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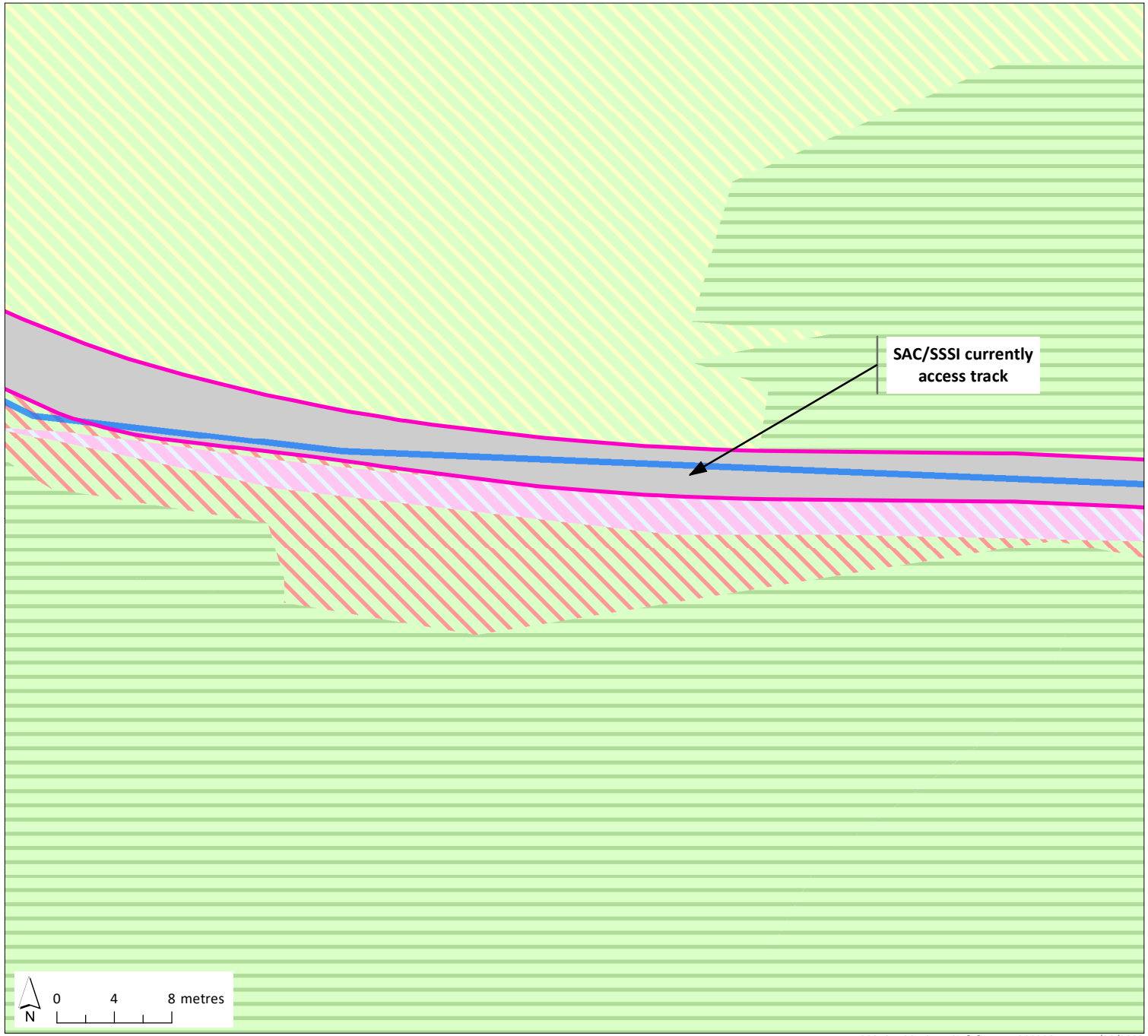


Cruachan 2

Example of SAC/SSSI Ground Currently Access Track

Site boundary

Development footprint

SAC/SSSI boundary

Existing habitats:

E1.71: Nardus stricta acid grasslands

E1.72#: Grass-heath

E5.31: Sub-Atlantic bracken fields

F4.11: Northern wet heaths

J4: Roads, tracks and hard standing

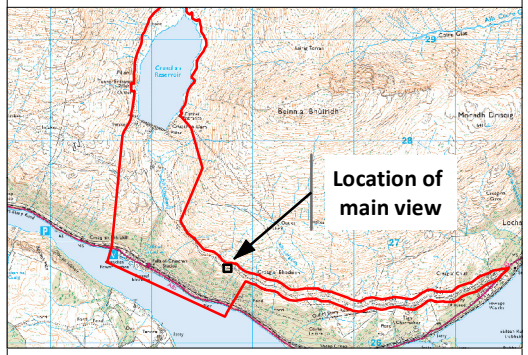


Figure 4

Map Scale @ A4: 1:400

Surveyed by: AEL	
Survey date: 2021	
Drawn by: RAH	
Checked by: DS	
Status: Final	

Applied Ecology Ltd

Cruachan 2

Location of SAC/SSSI Direct Impacts

- Site boundary
- SAC/SSSI boundary
- SAC/SSSI direct impacts

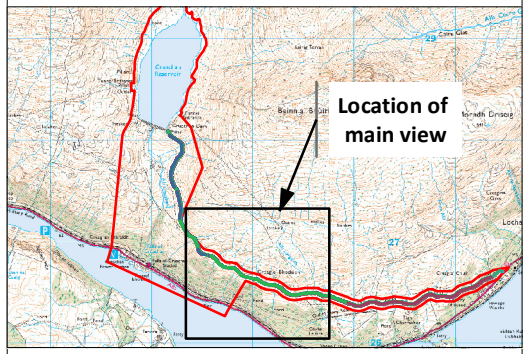


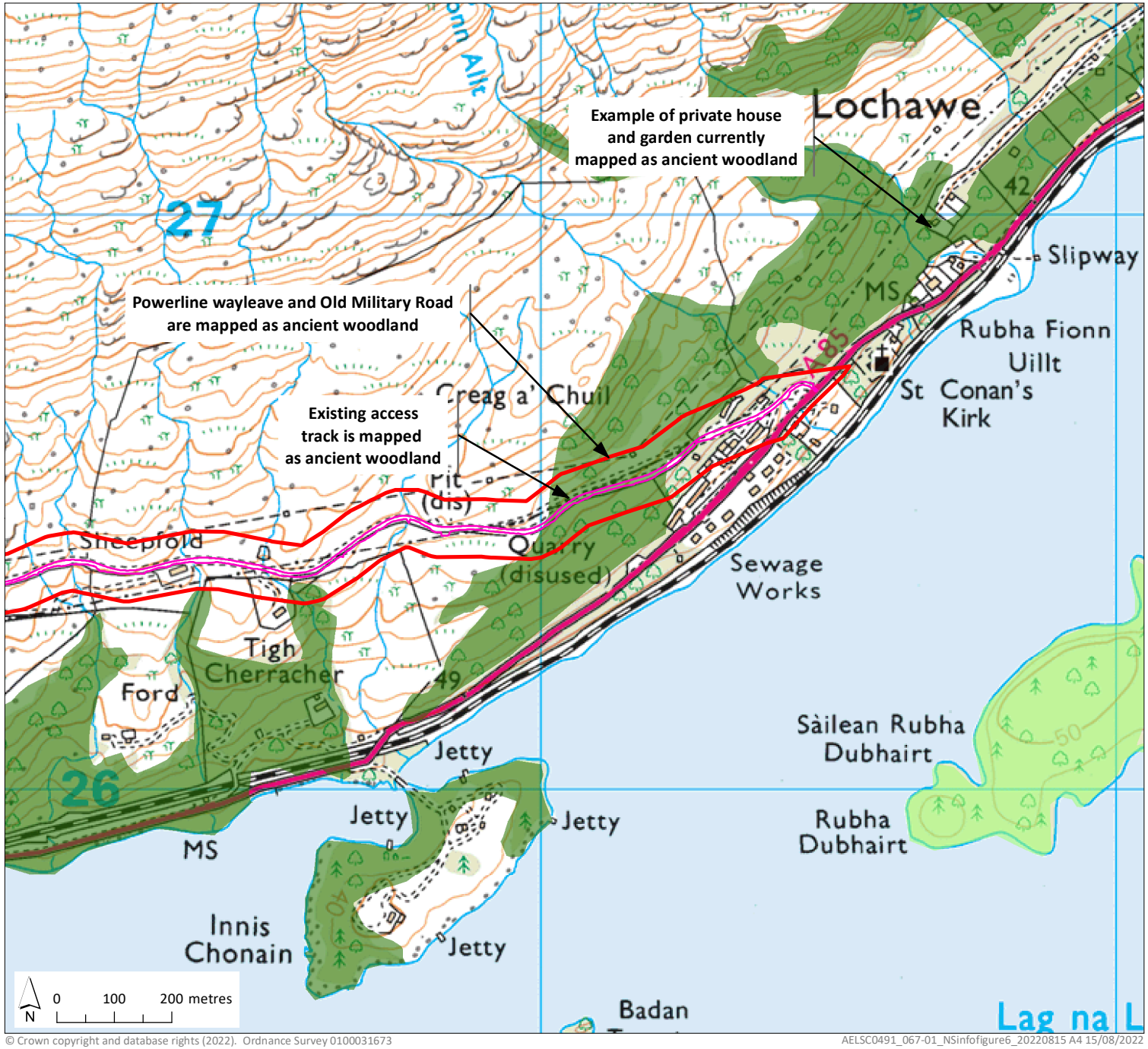
Figure 5

Map Scale @ A4: 1:7,500

Surveyed by: AEL	
Survey date: 2021	
Drawn by: RAH	
Checked by: DS	
Status: Final	

Applied Ecology Ltd

AELSC0491_066-01_NSinfofigure5_20220815 A4 15/08/2022



AELSC0491_067-01_NSinfofigure6_20220815 A4 15/08/2022

Cruachan 2

Ancient Woodland Impacts

Site boundary

Development footprint

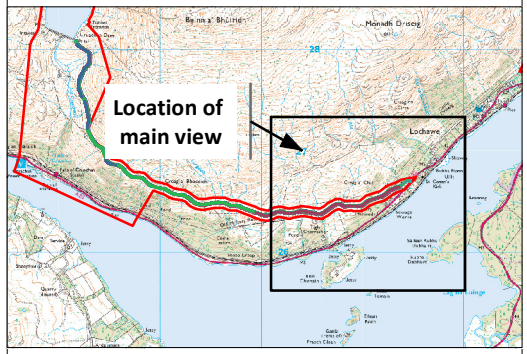


Figure 6

Map Scale @ A4: 1:10,000

Surveyed by: AEL	
Survey date: 2021	
Drawn by: RAH	
Checked by: DS	
Status: Final	

Applied Ecology Ltd

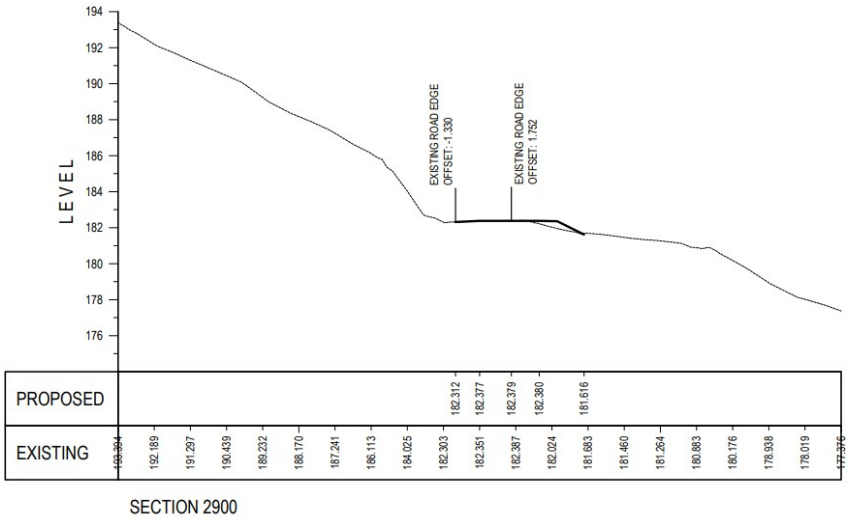
From: Martin, Alexa <Alexa.Martin@stantec.com>
Sent: 26 August 2022 16:37
To: Ruari Dunsmuir; Brogan A (Alan)
Cc: Rachel Hirst; Fraser, Lynsey; Szylak, Stuart; Steve Marshall; Econsents Admin
Subject: RE: ECU00004492 Cruachan Expansion NatureScot Comments
Attachments: AELSC0491_068-01_NSdetailMap1_20220822.pdf; AELSC0491_069-01 _NSdetailMap2_20220822.pdf

Hello Ruari,

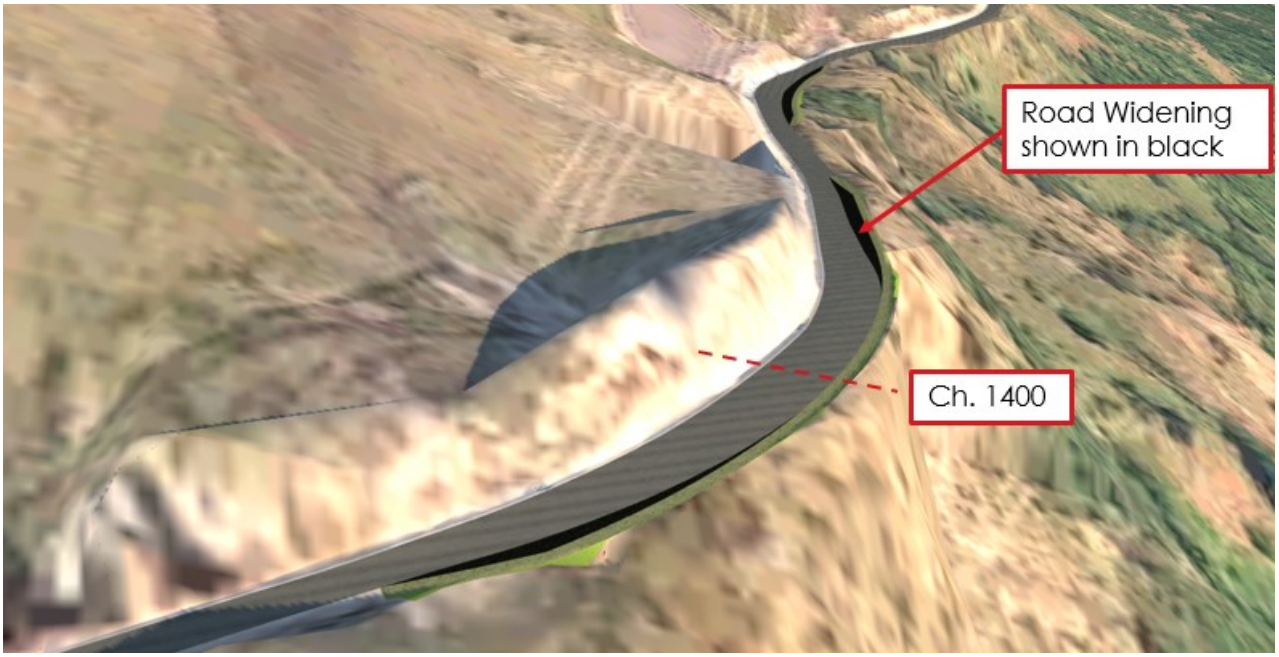
Further to your queries below, we have provided some additional information here on a point-by-point basis.

Q1: How much habitat will be lost to slope stabilisation along its entire length?
A1: As set out in our letter of 15 August 2022, 0.13 ha (1281 m^2), of the SAC/SSSI, of which 0.04 ha is existing access track, will be taken up for widening of the existing access track. The habitat loss calculations include the batter edges and land-take needed for stabilisation, as well as the track widening, as it is not possible to widen the track without that stabilisation due to the gradients involved. Within the 1281 m^2 there is 128 m^2 of habitat classified as oak/birch woodland, but this is all non-wooded verge albeit ecologically part of the woodland habitat mosaic.

Q2: How will stabilisation be achieved?
A2: There are 9 locations of proposed widening (see A4 below and attached maps). For all areas except Location 2 we are proposing to use standard earthwork slopes, up to a maximum of 1:2 slope to tie into the existing ground - see typical section below. We have focused all the widening to be in areas where no significant support would be required.



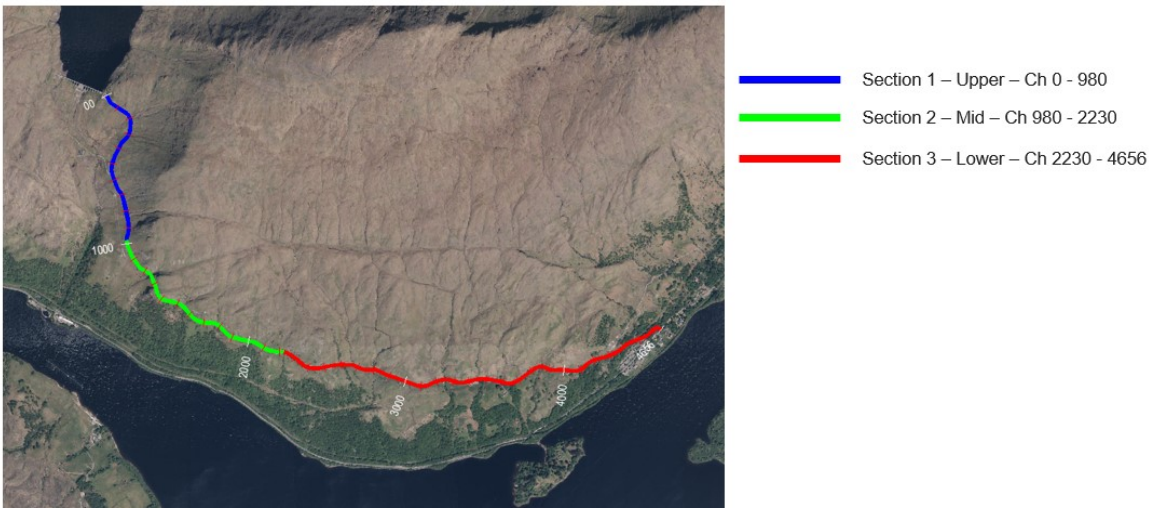
The exception to this is the ground around Location 2, which is highly constrained. At this stage of design, we assumed some widening either side of the bend where the earthworks would fit (see model extract below). However, if the extent of widening proposed is to be progressed it is likely that a structural solution would be required through this section to support the widening and also parapet replacement. The structure element has not yet been designed and may be of the form of gabion baskets/reinforced concrete retaining wall, sheet piles etc., all to be informed at the next stage of design by a structural engineer.



Q3: How much ground within the SAC will be affected by the stabilisation?
A3: The road widening cannot be achieved without vertical support to ensure slope stabilisation, and this is included in the habitat loss calculations previously provided and also set out in response to question 1 above – c. 0.13 ha, of which 0.04 ha is actually existing track.

Q4: Need detailed maps showing all of the places where widening/stabilisation needs to take place.
A4: The overview in the previously provided Figure 5 showed the nine locations where widening will be needed. These are shown in more detail on the attached diagrams.

Q5: Does the discontinuation of the traffic management system thereby require further track widening compared to the original scheme?
A5: The Traffic Management System was considered for the central section of the Dam access road (section 2 on below diagram) when we were looking at options for removing spoil from the upper reservoir area, but because of the topography adjacent the central section (both above and below the access road) it means that passing places cannot be formed without very significant engineering operations and there would be considerable safety implications. This and community consultation meant we then looked at alternative options for spoil removal for the upper intake.
The discontinuance of a TMS has not altered the requirement for passing places at the upper and lower sections and has not increased the extent of passing places/widening currently proposed.



I hope that this is helpful, but please do get back to us if you have further questions. In particular, we would be pleased to accompany you on a site visit if this would be useful.

Kind regards,
Alexa

Alexa Martin MRTPI
Senior Planner

5th Floor, Lomond House, 9 George Square, Glasgow G2 1DY
Direct: +44 (0)141 352 2377
alexa.martin@stantec.com

From: Ruari Dunsmuir <Ruari.Dunsmuir@nature.scot>
Sent: 18 August 2022 11:31
To: Martin, Alexa <Alexa.Martin@stantec.com>; Alan.Brogan@gov.scot
Cc: Rachel Hirst <rachel.hirst@appliedecology.co.uk>
Subject: RE: ECU00004492 Cruachan Expansion NatureScot Comments

Good morning

Thank you for the additional information.

The document includes some extractions from the overall length of the track to illustrate what is meant by route widening under three different scenarios, but doesn't provide details of how much habitat will be lost overall to slope stabilisation along its entire length, how this stabilisation will be achieved and how much ground within the SAC will be impacted by this, as well as a detailed map that shows all of the places where route widening/stabilisation needs to happen, so that we can fully analysis the impact on qualifying habitat.

Additionally, it is stated that the traffic management system is now no longer being considered. Given this was part of the original proposal, reducing the amount of track to be widened, does the discontinuation of the traffic management system thereby require further track widening compared to the original scheme?

Regards
Ruari

Ruari Dunsmuir | Operations Officer – West
NatureScot | Cameron House, Albany Street, Oban, Argyll, PA34 4AE | **m:** 07909 793 221
NàdarAlba | Taigh Chamshron, Sràid Albanaidh, An t-Òban, Earra-Ghàidheal, PA34 4AE
nature.scot | @nature_scot | *Scotland's Nature Agency* | *Buidheann Nàdair na h-Alba*

From: Martin, Alexa <Alexa.Martin@stantec.com>
Sent: 15 August 2022 17:52
To: Alan.Brogan@gov.scot
Cc: James.McKenzie@gov.scot; Econsents_Admin@gov.scot; Ruari Dunsmuir <Ruari.Dunsmuir@nature.scot>; David Maclennan <David.Maclennan@nature.scot>; Fraser, Lynsey <Lynsey.Fraser@stantec.com>; Szylak, Stuart <Stuart.Szylak@stantec.com>; Steve Marshall <steve.marshall@drax.com>
Subject: ECU00004492 Cruachan Expansion NatureScot Comments

Dear Alan

In response to the written consultee comments made by NatureScot to the above application, please find attached a letter containing further information to address and clarify the points raised by NatureScot in relation to the Loch Etive Woods Special Area of Conservation and the Coille Leitire Site of Special Scientific Interest. The response has been prepared following a meeting between Applied Ecology and NatureScot.

I would be grateful if you can please confirm receipt.

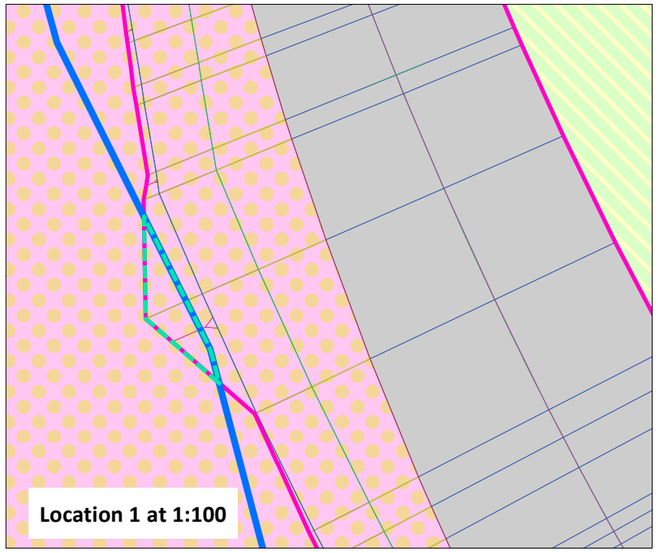
Regards,
Alexa

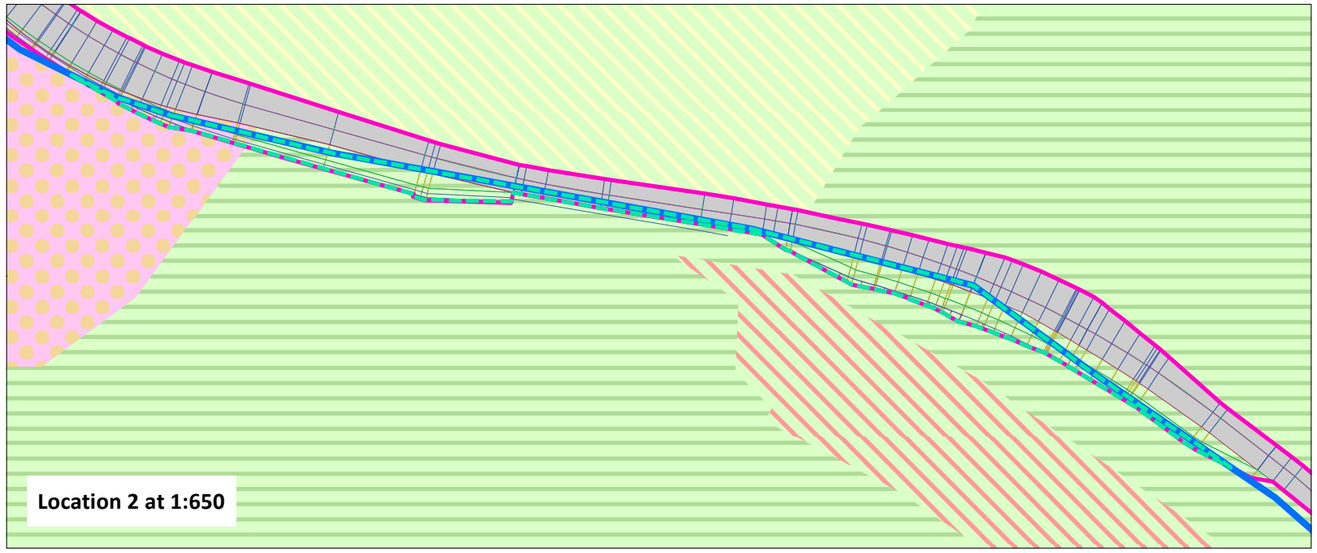
Alexa Martin MRTPI
Senior Planner

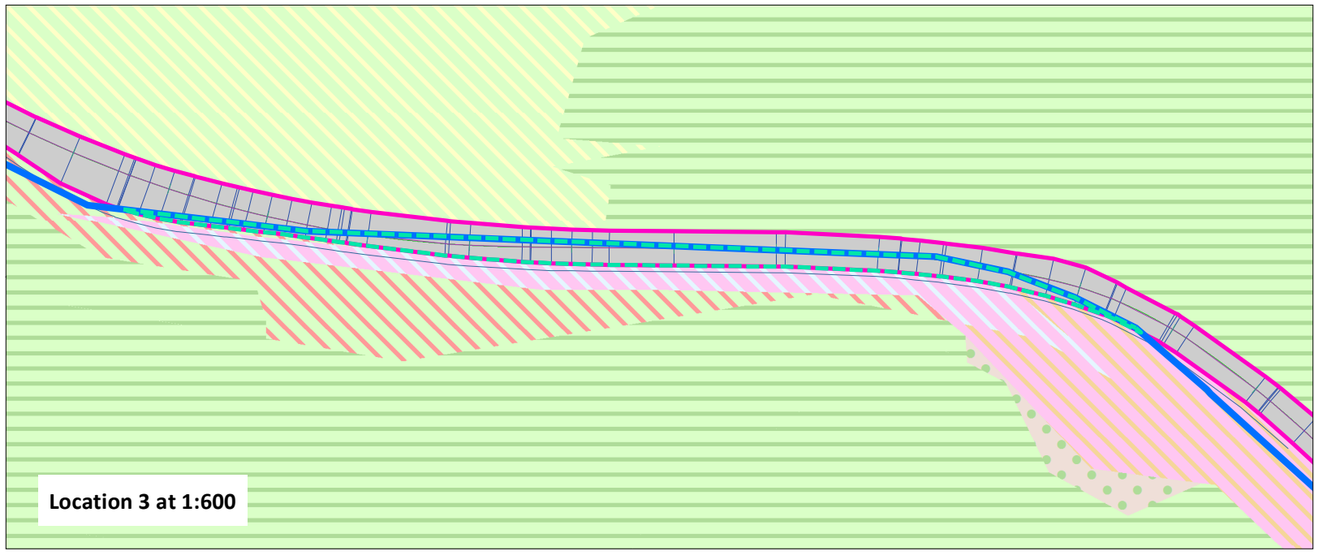
5th Floor, Lomond House, 9 George Square, Glasgow G2 1DY
Direct: +44 (0)141 352 2377
alexa.martin@stantec.com

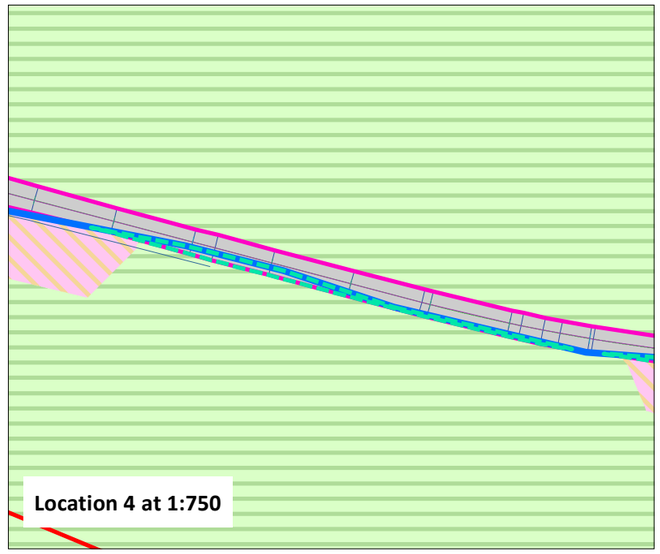
Cruachan 2

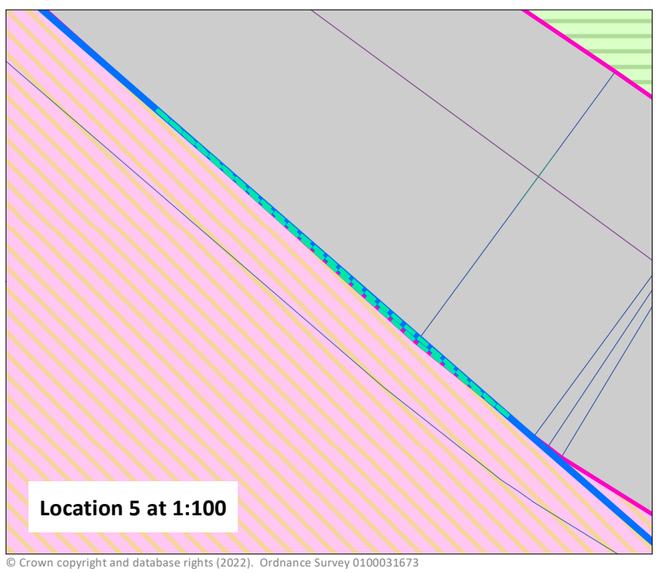
Location of SAC/SSSI Direct Impacts Map 1 of 2

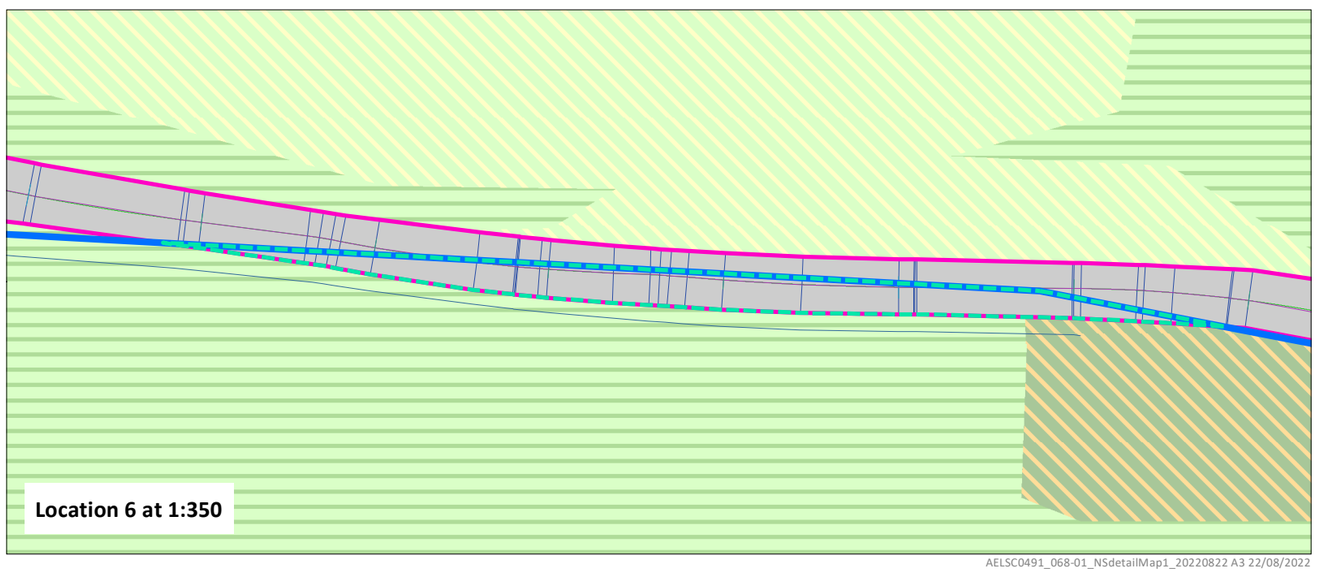












Site boundary
SAC/SSSI boundary
SAC/SSSI direct impacts
Development footprint

Habitats:

- E1.71: Nardus stricta acid grasslands
- E5.31: Sub-Atlantic bracken fields
- F4.21: Sub-montane heath
- G1.91: Oak/birch woodland
- J4: Roads, tracks and hard standing

Details of topographical survey and engineering modelling of required widening are also shown on these drawings.

Please see maps provided in TA8.1 for full legend of displayed habitats.

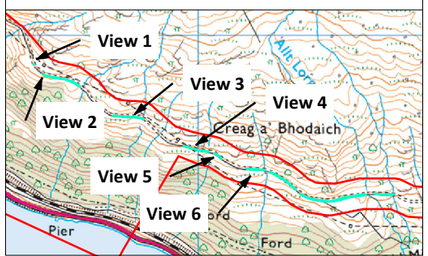


Figure 7a (Scaled at A3)

Surveyed by: RAH	
Survey date: August 2021	
Drawn by: RAH	
Checked by: SM	
Status: Final	

Applied Ecology Ltd

Cruachan 2

Location of SAC/SSSI Direct Impacts Map 2 of 2

- Site boundary
- SAC/SSSI boundary
- SAC/SSSI direct impacts
- Development footprint

Habitats:

- E1.71: Nardus stricta acid grasslands
- E5.31: Sub-Atlantic bracken fields
- F4.21: Sub-montane heath
- G1.91: Oak/birch woodland
- J4: Roads, tracks and hard standing

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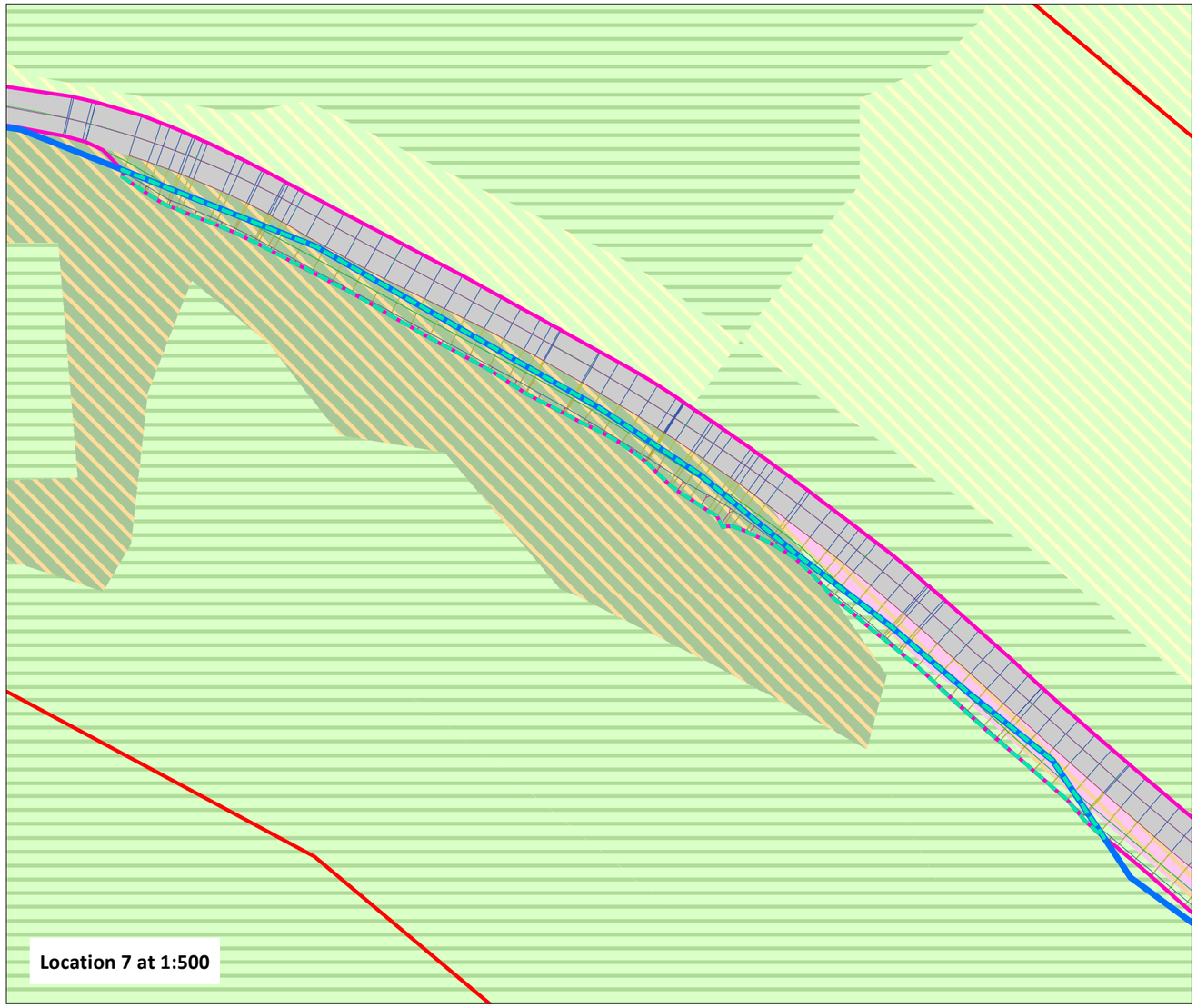

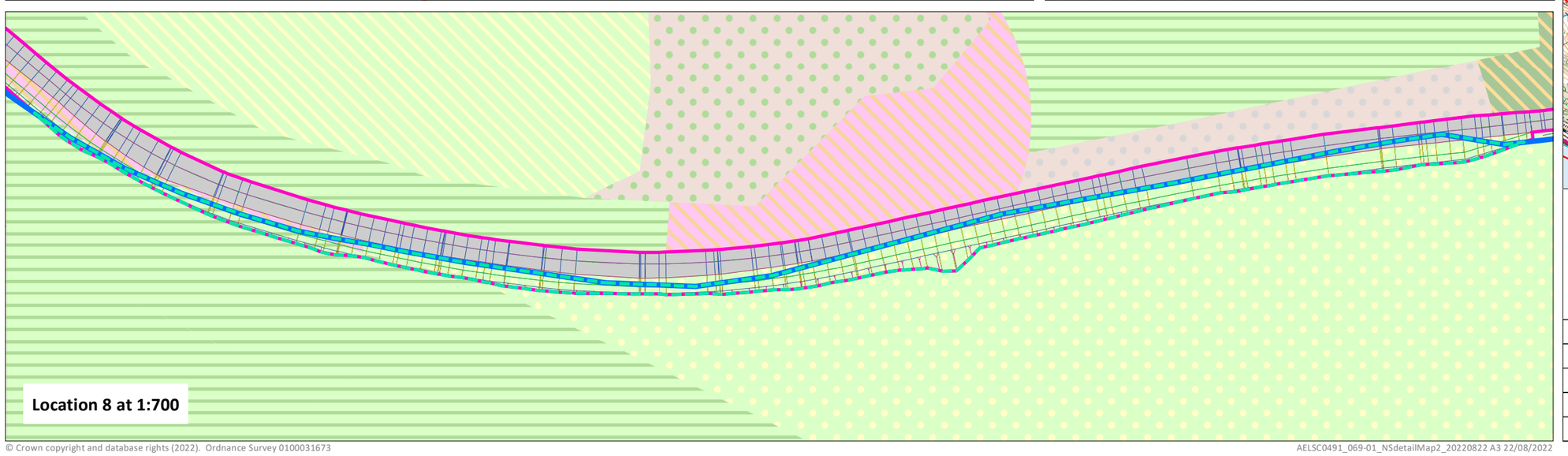

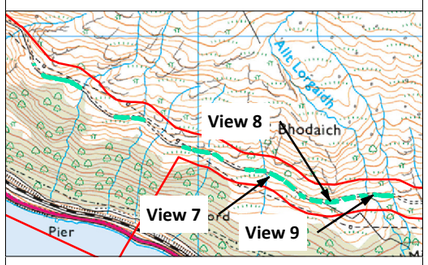

Figure 7b (Scaled at A3)

Surveyed by: AEL	
Survey date: August 2021	
Drawn by: RAH	
Checked by: SM	
Status: Final	

Applied Ecology Ltd

From: Szylak, Stuart <Stuart.Szylak@stantec.com>
Sent: 25 October 2022 14:32
To: Ruari Dunsmuir; Brogan A (Alan); McKenzie JR (James)
Cc: Fraser, Lynsey; Steve Marshall; Econsents Admin; Martin, Alexa
Subject: RE: ECU00004492 Cruachan Expansion NatureScot Comments
Attachments: Cross Sections.pdf; Road Widening Drawings in SAC.pdf; SAC Impact Clarifications Report 25 October 2022.pdf

Good afternoon Ruari,

Further to our site visit last month and your request for further clarifications I am pleased to attach the following for your information.

1) Marked up technical drawings (as used on site visit) to show more clearly the existing deer fence and SAC boundary, as these relate to the proposed widening works. We agreed on site that, in practice, the SAC boundary would be aligned tightly to the southern edge of the existing metalled road.
2) Provision of cross sections at key points, to show how widening and earthworks would sit in the topography. On site we agreed that at this bend, where topography drops away quite quickly, it would be useful for you to see how this encroachment into the SAC may look in profile. The previous commentary provided (see Q2 response in email trail below) regarding the stabilisation technique still applies.
3) Updated SAC impact report, including updated habitat loss calculations, based on the SAC boundary being aligned to the edge of the metalled road. As discussed on site, there will be a small encroachment into two areas where there is existing tree (birch) cover. The area of this encroachment has been calculated, in total along the whole length of the works, at 210m^2. The precise number of trees that could be lost as a result of the widening works is not yet known. Once a contractor is on-board and we know their precise construction methods and requirements we can be precise about what, if any, impact there will be on existing trees.

We trust that these clarifications will assist in your consideration and allow you to remove your holding objection of 5 July 2022.

Yours sincerely

Stuart

Stuart Szylak BSc(hons)
Associate Environmental Planner

Edinburgh (Charlotte Lane) SCT Office
stuart.szylak@Stantec.com

Mobile: +44 (0) 7843819022

Stantec

From: Ruari Dunsmuir <Ruari.Dunsmuir@nature.scot>
Sent: 30 August 2022 11:06
To: Martin, Alexa <Alexa.Martin@stantec.com>; Alan.Brogan@gov.scot

Cc: Rachel Hirst <rachel.hirst@appliedecology.co.uk>; Fraser, Lynsey <Lynsey.Fraser@stantec.com>; Szylak, Stuart <Stuart.Szylak@stantec.com>; Steve Marshall <steve.marshall@drax.com>; Econsents_Admin@gov.scot
Subject: RE: ECU00004492 Cruachan Expansion NatureScot Comments

Good morning

We would like to arrange a site visit with yourselves to discuss the issue in more detail in order to help us understand and gauge the potential impacts on the SAC/SSSI.

Current potential dates for us are: September - Tuesday 6th, Wednesday 7th, Tuesday 13th, and Wednesday 21st. Meeting 1030 earliest at a suitable location at the start of the access track, looking to walk the length of it, or enough of it for our purposes. Ideally we would like to ensure someone with knowledge in the road construction details is also present. I hope one of these days would be suitable, if you could let me know please.

Regards
Ruari

Ruari Dunsmuir | Operations Officer – West
NatureScot | Cameron House, Albany Street, Oban, Argyll, PA34 4AE | **m:** 07909 793 221
NàdarAlba | Taigh Chamshron, Sràid Albanaidh, An t-Òban, Earra-Ghàidheal, PA34 4AE
nature.scot | @nature_scot | *Scotland's Nature Agency* | *Buidheann Nàdair na h-Alba*

From: Martin, Alexa <Alexa.Martin@stantec.com>
Sent: 26 August 2022 16:37
To: Ruari Dunsmuir <Ruari.Dunsmuir@nature.scot>; Alan.Brogan@gov.scot
Cc: Rachel Hirst <rachel.hirst@appliedecology.co.uk>; Fraser, Lynsey <Lynsey.Fraser@stantec.com>; Szylak, Stuart <Stuart.Szylak@stantec.com>; Steve Marshall <steve.marshall@drax.com>; Econsents_Admin@gov.scot
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Hello Ruari,

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Q1: How much habitat will be lost to slope stabilisation along its entire length?
A1: As set out in our letter of 15 August 2022, 0.13 ha (1281 m^2), of the SAC/SSSI, of which 0.04 ha is existing access track, will be taken up for widening of the existing access track. The habitat loss calculations include the batter edges and land-take needed for stabilisation, as well as the track widening, as it is not possible to widen the track without that stabilisation due to the gradients involved. Within the 1281 m^2 there is 128 m^2 of habitat classified as oak/birch woodland, but this is all non-wooded verge albeit ecologically part of the woodland habitat mosaic.

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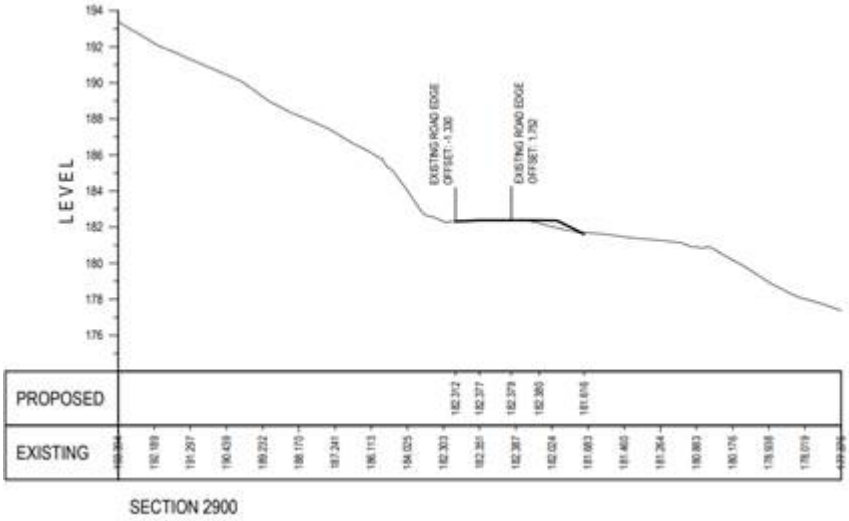
A2: There are 9 locations of proposed widening (see A4 below and attached maps). For all areas except Location 2 we are proposing to use standard earthwork slopes, up to a maximum of 1:2 slope to tie into the existing ground - see typical section below. We have focused all the widening to be in areas where no significant support would be required.



The exception to this is the ground around Location 2, which is highly constrained. At this stage of design, we assumed some widening either side of the bend where the earthworks would fit (see model extract below). However, if the extent of widening proposed is to be progressed it is likely that a structural solution would be required through this section to support the widening and also parapet replacement. The structure element has not yet been designed and may be of the form of gabion baskets/reinforced concrete retaining wall, sheet piles etc., all to be informed at the next stage of design by a structural engineer.

Q3: How much ground within the SAC will be affected by the stabilisation?
A3: The road widening cannot be achieved without vertical support to ensure slope stabilisation, and this is included in the habitat loss calculations previously provided and also set out in response to question 1 above – c. 0.13 ha, of which 0.04 ha is actually existing track.

Q4: Need detailed maps showing all of the places where widening/stabilisation needs to take place.
A4: The overview in the previously provided Figure 5 showed the nine locations where widening will be needed. These are shown in more detail on the attached diagrams.

Q5: Does the discontinuation of the traffic management system thereby require further track widening compared to the original scheme?
A5: The Traffic Management System was considered for the central section of the Dam access road (section 2 on below diagram) when we were looking at options for removing spoil from the upper reservoir area, but because of

the topography adjacent the central section (both above and below the access road) it means that passing places cannot be formed without very significant engineering operations and there would be considerable safety implications. This and community consultation meant we then looked at alternative options for spoil removal for the upper intake.
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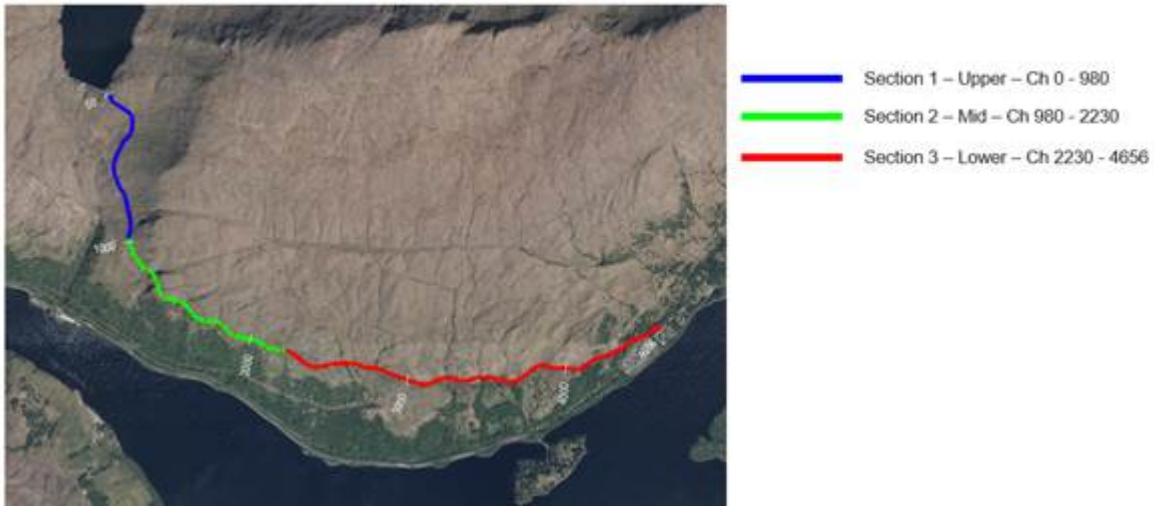

I hope that this is helpful, but please do get back to us if you have further questions. In particular, we would be pleased to accompany you on a site visit if this would be useful.

Kind regards,
Alexa

Alexa Martin MRTPI
Senior Planner

5th Floor, Lomond House, 9 George Square, Glasgow G2 1DY
Direct: +44 (0)141 352 2377
alexa.martin@stantec.com

Stantec

Better Together, Even If We're Apart. Read more about Stantec's COVID-19 response, including remote working and business continuity measures.

From: Ruari Dunsmuir <Ruari.Dunsmuir@nature.scot>
Sent: 18 August 2022 11:31
To: Martin, Alexa <Alexa.Martin@stantec.com>; Alan.Brogan@gov.scot
Cc: Rachel Hirst <rachel.hirst@appliedecology.co.uk>
Subject: RE: ECU00004492 Cruachan Expansion NatureScot Comments

Good morning

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The document includes some extractions from the overall length of the track to illustrate what is meant by route widening under three different scenarios, but doesn't provide details of how much habitat will be lost overall to slope stabilisation along its entire length, how this stabilisation will be achieved and how much ground within the

SAC will be impacted by this, as well as a detailed map that shows all of the places where route widening/stabilisation needs to happen, so that we can fully analysis the impact on qualifying habitat.

Additionally, it is stated that the traffic management system is now no longer being considered. Given this was part of the original proposal, reducing the amount of track to be widened, does the discontinuation of the traffic management system thereby require further track widening compared to the original scheme?

Regards
Ruari

Ruari Dunsmuir | Operations Officer – West
NatureScot | Cameron House, Albany Street, Oban, Argyll, PA34 4AE | **m:** 07909 793 221
NàdarAlba | Taigh Chamshron, Sràid Albanaidh, An t-Òban, Earra-Ghàidheal, PA34 4AE
nature.scot | @nature_scot | *Scotland's Nature Agency | Buidheann Nàdair na h-Alba*

From: Martin, Alexa <Alexa.Martin@stantec.com>
Sent: 15 August 2022 17:52
To: Alan.Brogan@gov.scot
Cc: James.McKenzie@gov.scot; Econsents_Admin@gov.scot; Ruari Dunsmuir <Ruari.Dunsmuir@nature.scot>; David Maclennan <David.Maclennan@nature.scot>; Fraser, Lynsey <Lynsey.Fraser@stantec.com>; Szylak, Stuart <Stuart.Szylak@stantec.com>; Steve Marshall <steve.marshall@drax.com>
Subject: ECU00004492 Cruachan Expansion NatureScot Comments

Dear Alan

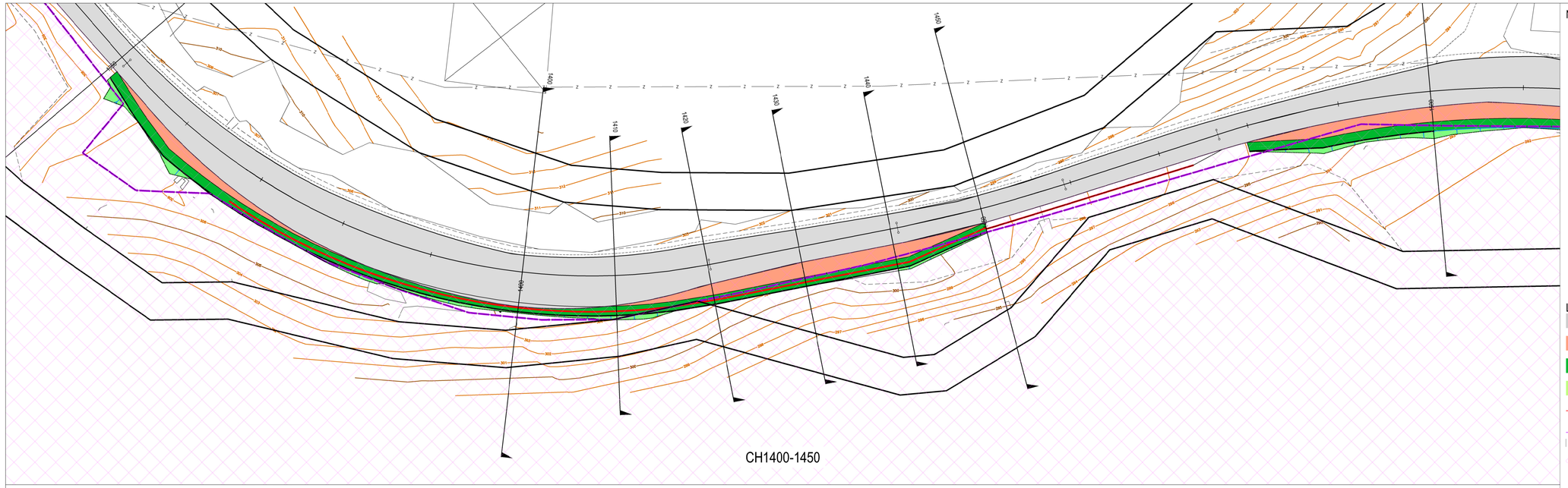
In response to the written consultee comments made by NatureScot to the above application, please find attached a letter containing further information to address and clarify the points raised by NatureScot in relation to the Loch Etive Woods Special Area of Conservation and the Coille Leitire Site of Special Scientific Interest. The response has been prepared following a meeting between Applied Ecology and NatureScot.

I would be grateful if you can please confirm receipt.

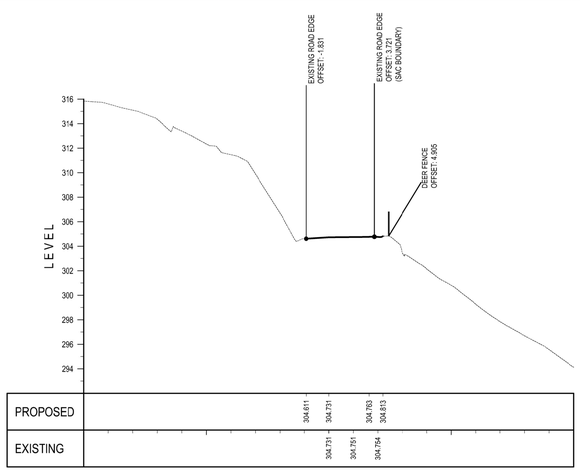
Regards,
Alexa

Alexa Martin MRTPI
Senior Planner

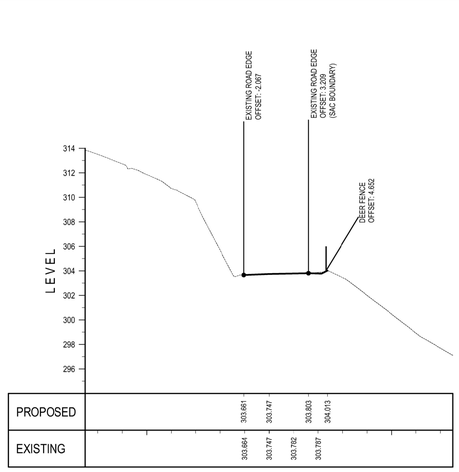
5th Floor, Lomond House, 9 George Square, Glasgow G2 1DY
Direct: +44 (0)141 352 2377
alexa.martin@stantec.com



CH1400-1450



SECTION 1400



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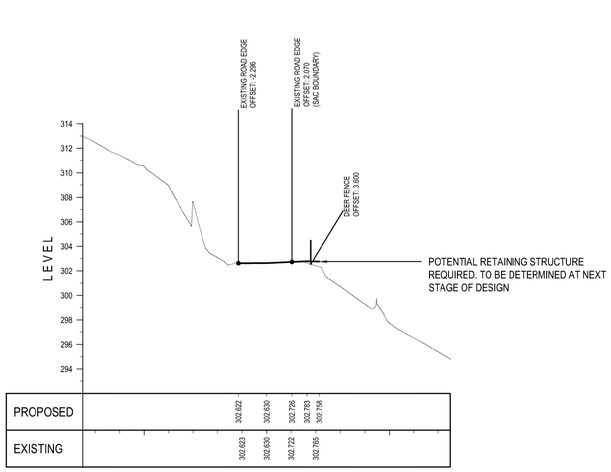

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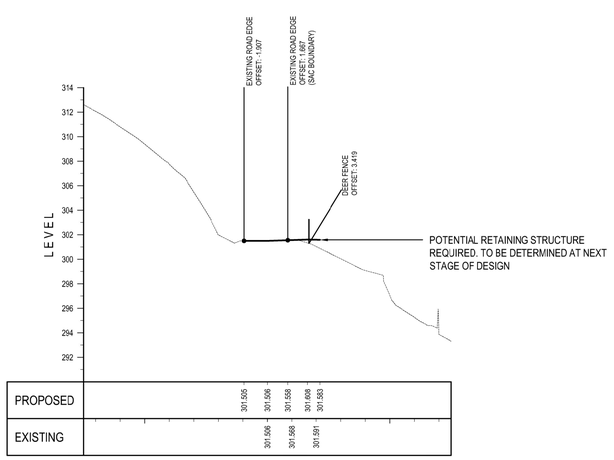

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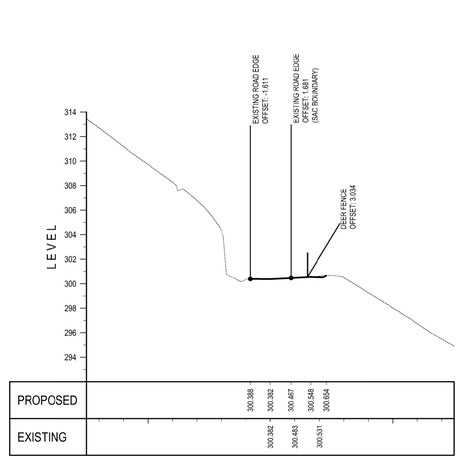

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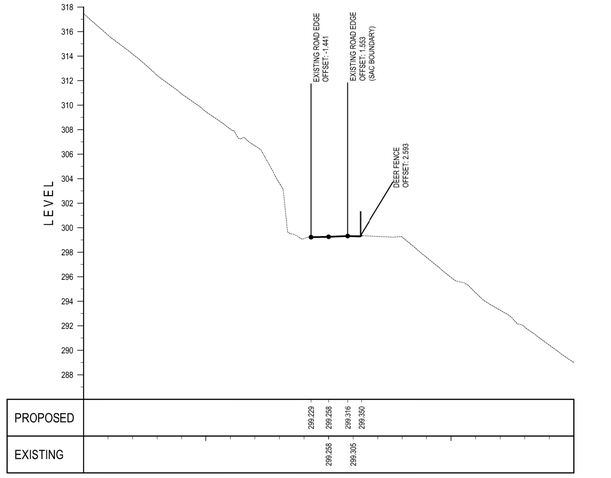

SECTION 1450

NOTES

1. ALL DIMENSIONS IN METERS AND ALL LEVELS IN METERS UNLESS SHOWN OTHERWISE.

LEGEND

- EXISTING ROAD SURFACE TO BE SCARIFIED AND RESURFACED
- NEW HAUL ROAD CONSTRUCTION
- NEW VERGE
- NEW EARTHWORKS
- NEW VEHICLE RESTRAINT BARRIER
- EXISTING DEER FENCE
- SPECIAL AREA OF CONSERVATION (SAC) EXTENTS

CURRENT VERSION INFORMATION

DATE	DRWN	CHKD	REVD	VER	REASON FOR ISSUE
04.10.22	CS	BR	DMcL	P01	DRAFT

DRAX CRUACHAN EXPANSION LTD
CRUACHAN 2

CROSS SECTIONS CH1400-1450

Stantec

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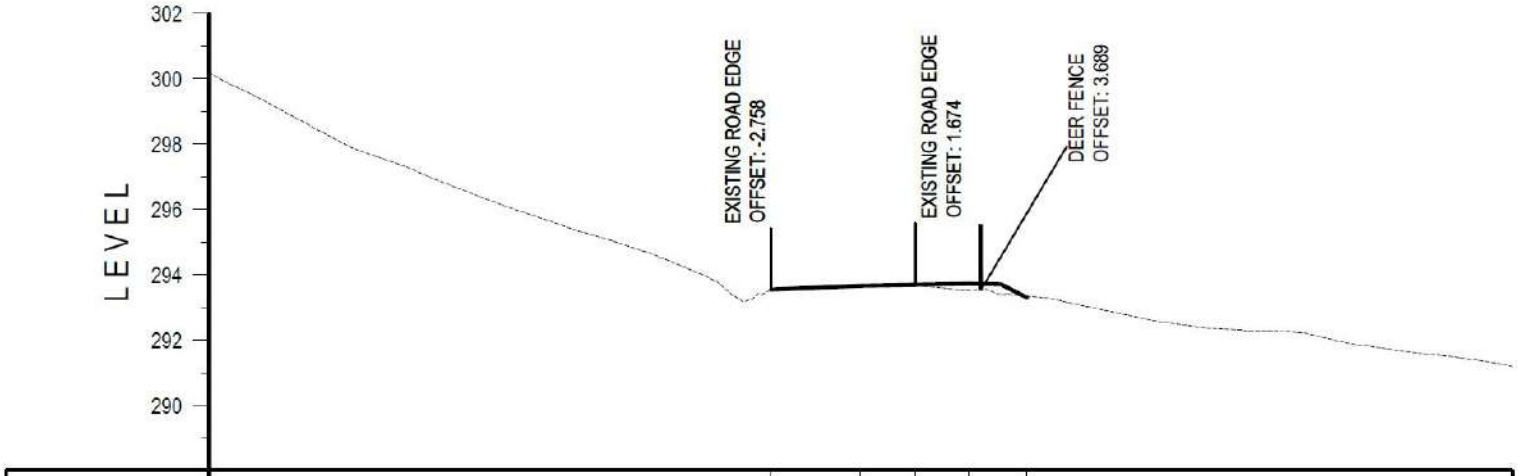
DRAWING NO. 331201086-001-C-0820		VERSION P01



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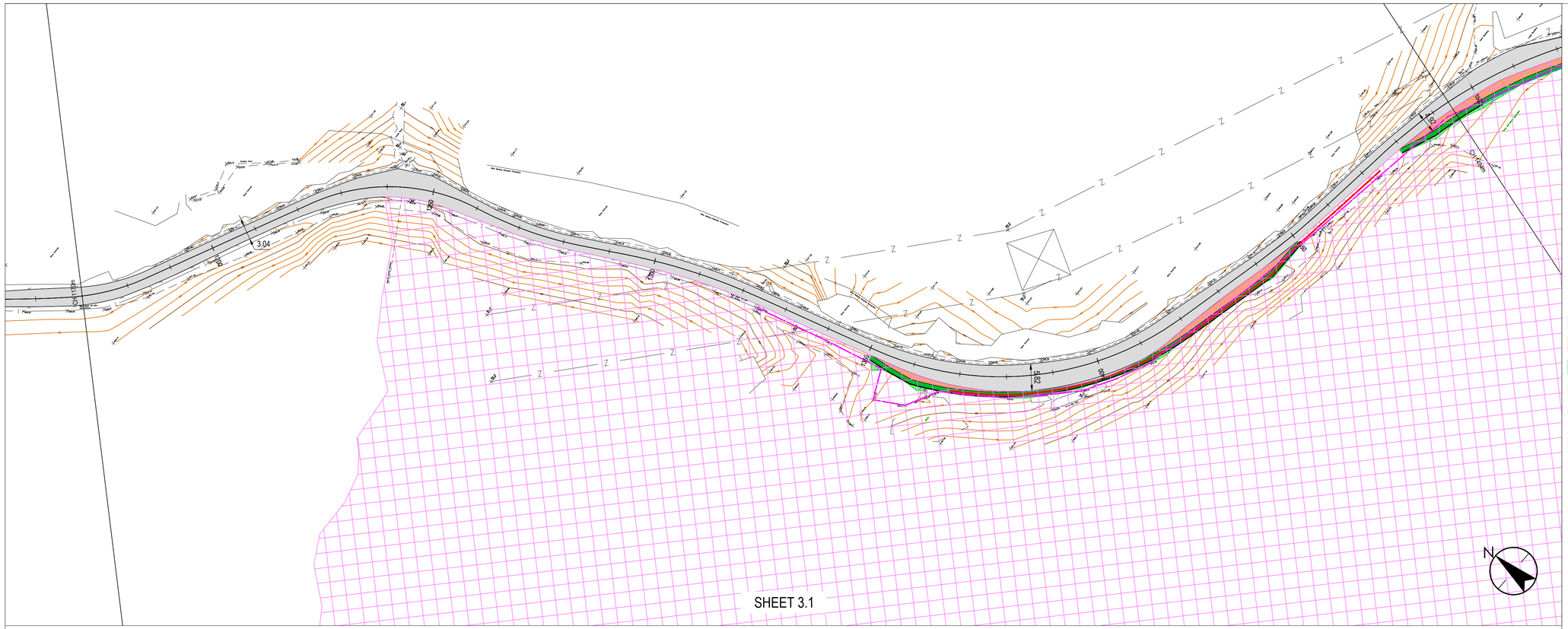
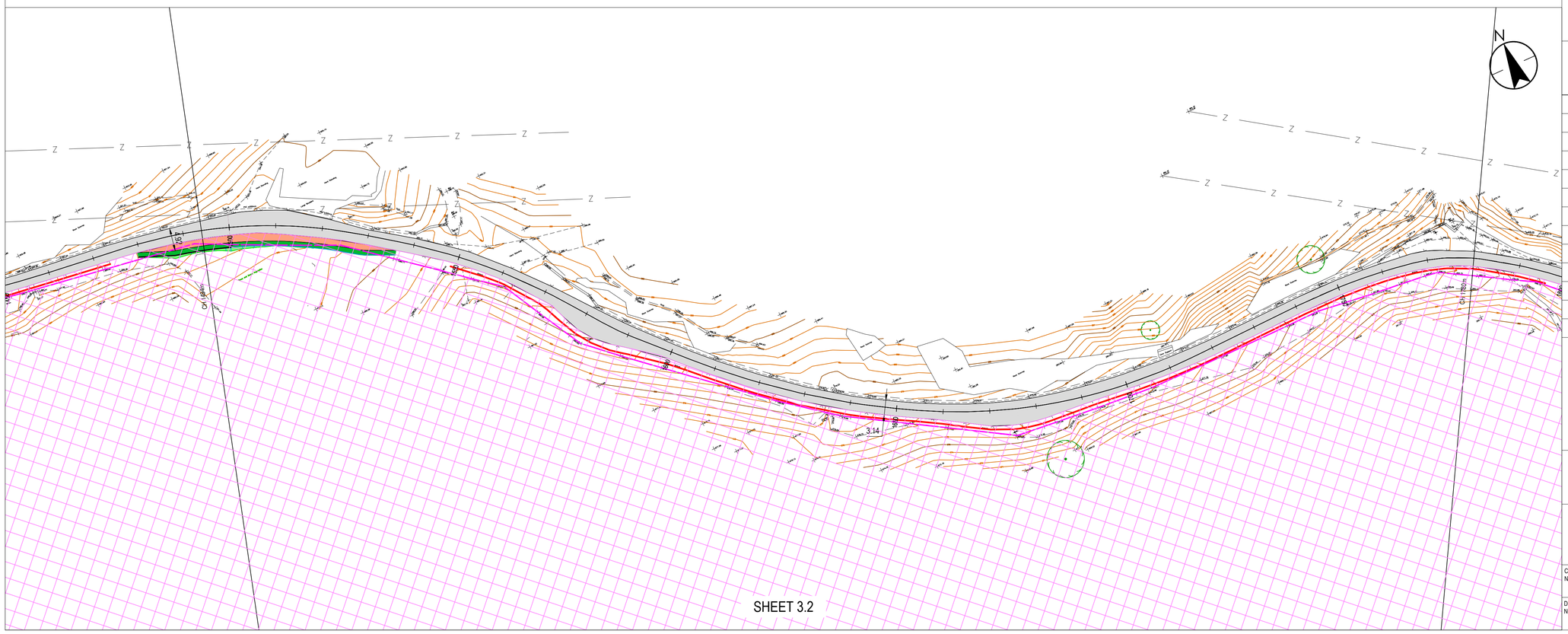
EXISTING	300.101	299.147	298.074	297.316	296.506	295.788	295.144	294.465	293.430	293.572	293.673	293.645	293.490	293.238	292.799	292.448	292.282	292.121	291.752	291.501	291.478

SECTION 1500





NOTES

1. ALL DIMENSIONS IN METERS AND ALL LEVELS IN METERS UNLESS SHOWN OTHERWISE.
2. EARTHWORK SLOPES ASSUMED TO BE 1:2. SLOPE STABILITY ANALYSIS TO BE CARRIED OUT TO CONFIRM
3. ROAD SIGNAGE REQUIREMENTS TO BE CONFIRMED
4. ROAD DRAINAGE REQUIREMENTS TO BE CONFIRMED

LEGEND

- EXISTING ROAD SURFACE TO BE SCARIFIED AND RESURFACED
- NEW HAUL ROAD CONSTRUCTION
- NEW VERGE
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- NEW VEHICLE RESTRAINT BARRIER
- EXISTING DEER FENCE
- SPECIAL AREA OF CONSERVATION (SAC) EXTENTS

CURRENT VERSION INFORMATION

DATE	DRWN	CHKD	REVD	VER	REASON FOR ISSUE
29.09.22	CS	BR	DMcL	P03	SAC BOUNDARY ADDED
09.09.22	BR	DMcL	DMcL	P02	DEER FENCE ADDED
15.09.21	BR	DMcL	MP	P01	DRAFT

DRAX CRUACHAN EXPANSION LTD
CRUACHAN 2

HAUL ROAD
PLAN LAYOUT SHEET 3 OF 8

drax

Stantec

CONTRACT NO.	SCALE	MASTER SIZE
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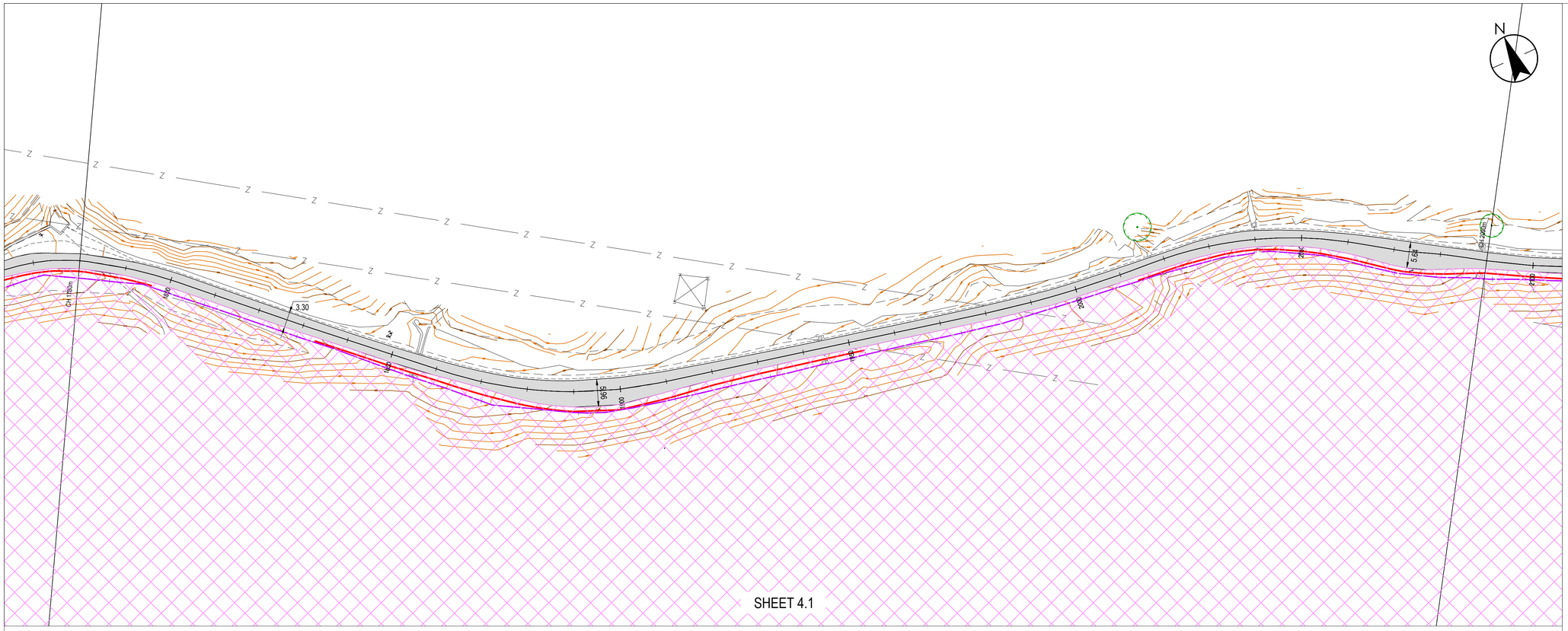
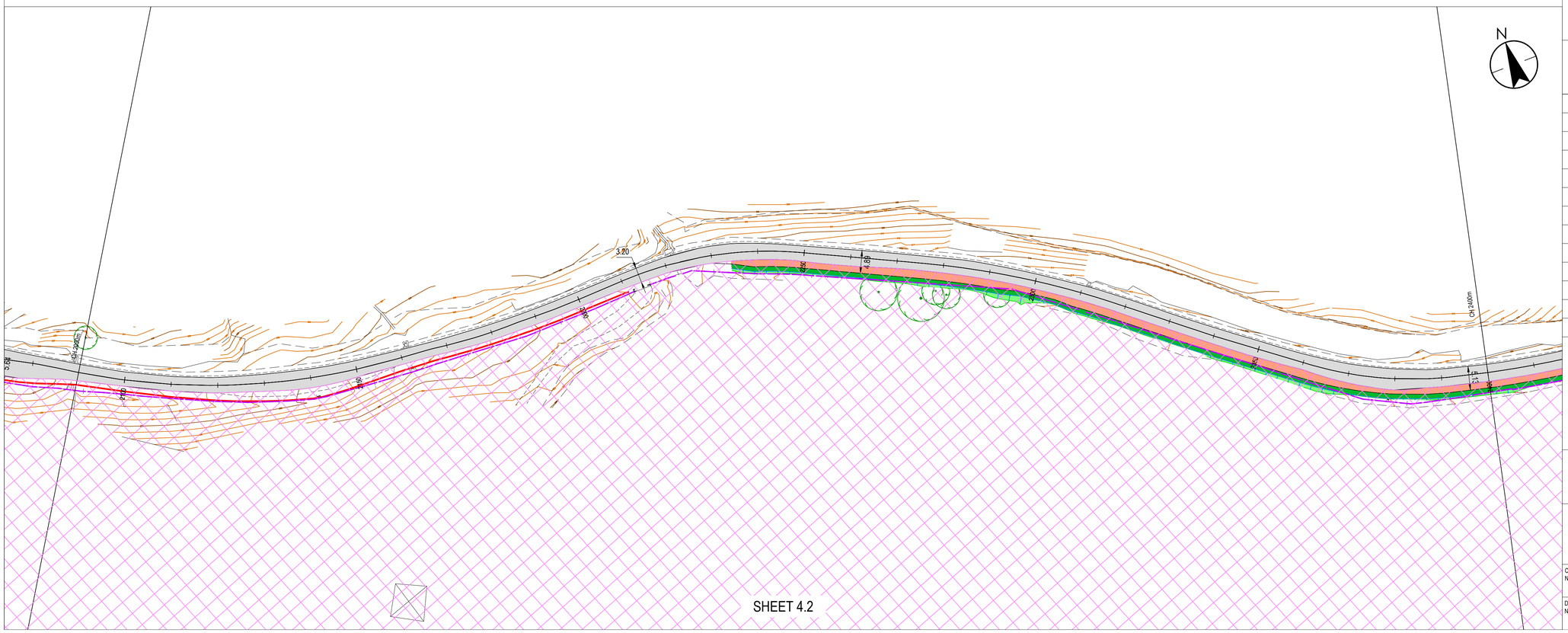
DRAWING NO.	VERSION
331201086-001-C-0804	P03





NOTES

1. ALL DIMENSIONS IN METERS AND ALL LEVELS IN METERS UNLESS SHOWN OTHERWISE.
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- NEW HAUL ROAD CONSTRUCTION
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- EXISTING DEER FENCE
- SPECIAL AREA OF CONSERVATION (SAC) EXTENTS

CURRENT VERSION INFORMATION

DATE	DRWN	CHKD	REVD	VER	REASON FOR ISSUE
29.09.22	CS	BR	DMcL	P03	SAC BOUNDARY ADDED
09.09.22	BR	DMcL	DMcL	P02	DEER FENCE ADDED
15.09.21	BR	DMcL	MP	P01	DRAFT

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CRUACHAN 2

HAUL ROAD
PLAN LAYOUT SHEET 4 OF 8

drax

Stantec

CONTRACT NO.	SCALE	MASTER SIZE
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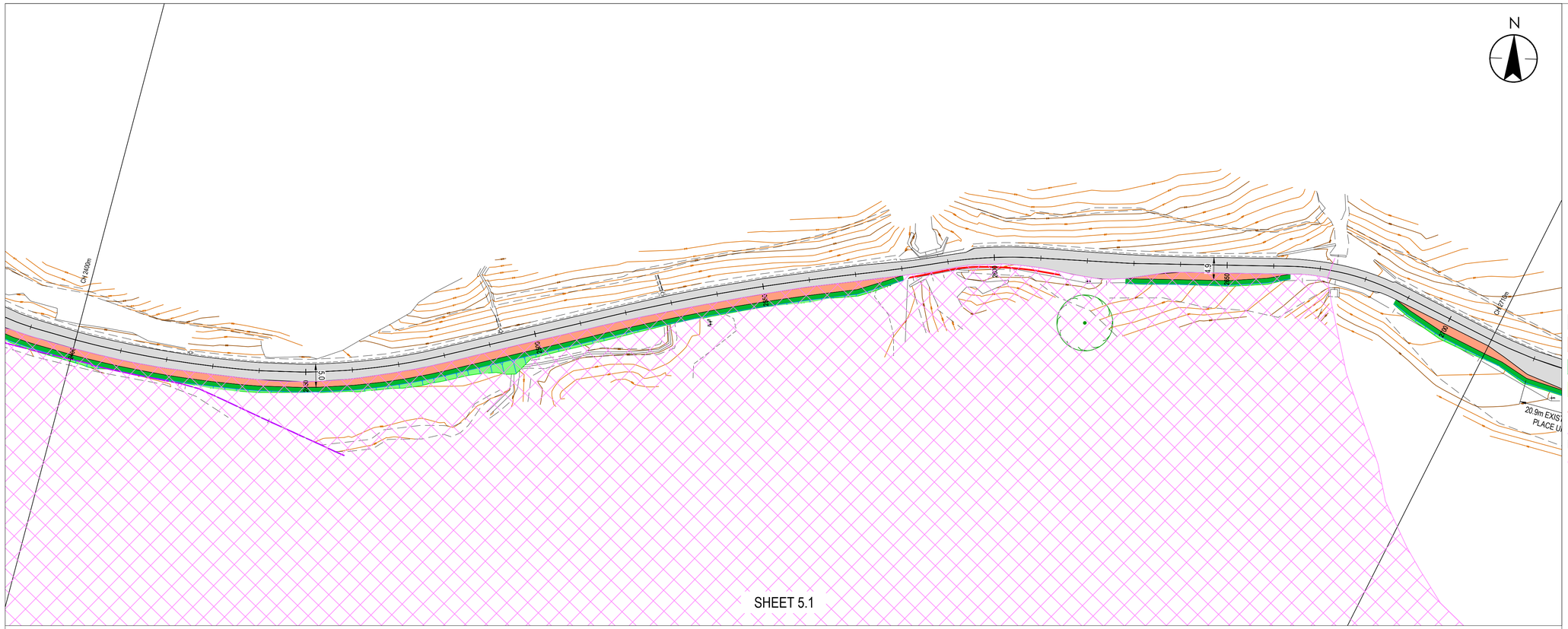
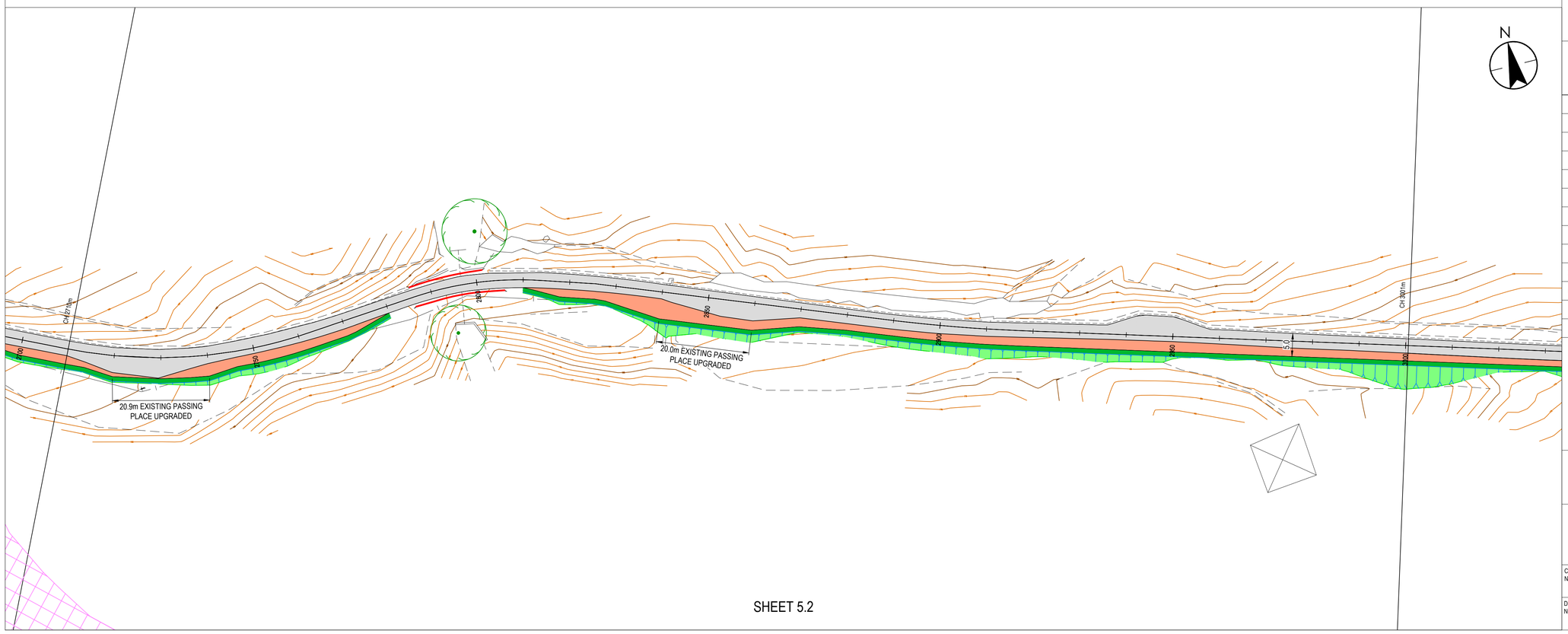
DRAWING NO.	VERSION
331201086-001-C-0805	P03





NOTES

1. ALL DIMENSIONS IN METERS AND ALL LEVELS IN METERS UNLESS SHOWN OTHERWISE.
2. EARTHWORK SLOPES ASSUMED TO BE 1:2. SLOPE STABILITY ANALYSIS TO BE CARRIED OUT TO CONFIRM
3. ROAD SIGNAGE REQUIREMENTS TO BE CONFIRMED
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- NEW VERGE
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- NEW VEHICLE RESTRAINT BARRIER
- EXISTING DEER FENCE
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CURRENT VERSION INFORMATION

DATE	DRWN	CHKD	REVD	VER	REASON FOR ISSUE
29.09.22	CS	BR	DMcL	P03	SAC BOUNDARY ADDED
09.09.22	BR	DMcL	DMcL	P02	DEER FENCE ADDED
15.09.21	BR	DMcL	MP	P01	DRAFT

DRAX CRUACHAN EXPANSION LTD
CRUACHAN 2

HAUL ROAD
PLAN LAYOUT SHEET 5 OF 8

drax

Stantec

CONTRACT NO.	SCALE	MASTER SIZE
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DRAWING NO.		VERSION
331201086-001-C-0806		P03

Cruachan 2

Loch Etive Woods SAC

NatureScot undertook a Site visit to the proposed Cruachan 2 development site on 06 September 2022. A number of actions arose as a result of that meeting, one of which was with regards to confirming impacts of the proposed access road widening on the Loch Etive Woods SAC. A request was made by NatureScot for the northern boundary of the SAC to be taken as the southern edge of the existing Cruachan Reservoir access road. Habitat loss as a result of widening on the southern edge of the access road should then be recalculated on the basis of this revised boundary.

Following this agreement on the SAC boundary, four impact zones arising as a result of the access road widening were identified, and these are illustrated in the figures accompanying this memo. These four areas total 1445 m^2 (0.14 ha).

The habitat types comprising this impact zone are summarised in the table below.

Habitat types (Scottish EUNIS)	Area (m^2)	% of SAC footprint
E1.72x: Semi-improved acid grassland	521	36.0
E5.31: Sub-Atlantic bracken fields	431	29.8
F4.21: Sub-montane heath	163	11.3
F4.22: Sub-Atlantic *Calluna* heaths	121	8.4
G1.91: Oak/birch woodland	210	14.6
Total	**1445**	**100.0**

The majority of the SAC habitats impacted by the access road widening will be semi-improved acid grassland or bracken. However, a small area (210 m^2) will be oak/birch woodland. This loss of woodland, which in the NVC would likely be considered to be W17, is associated with the works within impact zone 3 (see map A3), and to a lesser extent impact zone 4 (see map A5).

AEL, 24 October 2022

Cruachan 2

Loch Etive Woods Impacts - View 1

Site boundary

Loch Etive Woods SAC

Revised SAC footprint

Habitats:

E1.71: Nardus stricta acid grasslands

E5.31: Sub-Atlantic bracken fields

F4.22: Sub-Atlantic Calluna heaths

J4: Roads, tracks and hard standing

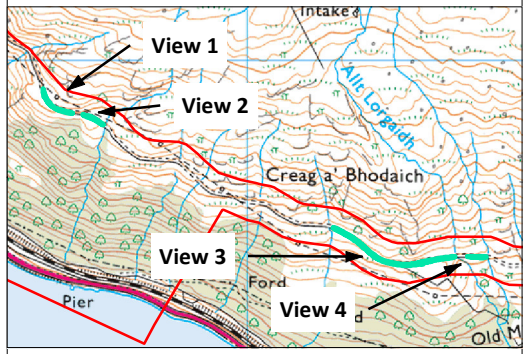


Figure A1

Map Scale @ A4: 1:500

Surveyed by: AEL	
Survey date: 2021	
Drawn by: RAH	
Checked by: Stantec	
Status: Final	

Applied Ecology Ltd

N 0 5 10 metres

Cruachan 2

Loch Etive Woods Impacts - View 2

Site boundary

Loch Etive Woods SAC

Revised SAC footprint

Habitats:

E1.71: Nardus stricta acid grasslands

E1.72#: Grass-heath

E5.31: Sub-Atlantic bracken fields

G1.91: Oak/birch woodland

J4: Roads, tracks and hard standing

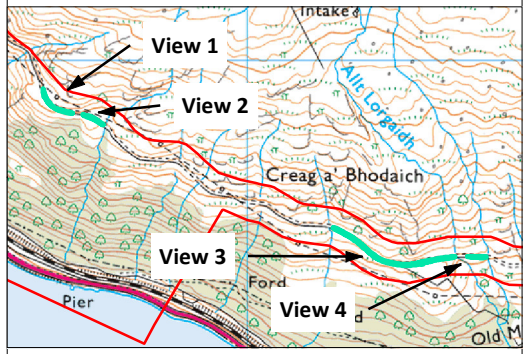


Figure A2

Map Scale @ A4: 1:500

Surveyed by: AEL	
Survey date: 2021	
Drawn by: RAH	
Checked by: Stantec	
Status: Final	

Applied Ecology Ltd

N 0 5 10 metres

Cruachan 2

Loch Etive Woods Impacts - View 3a

Site boundary
Loch Etive Woods SAC
Revised SAC footprint

Habitats:

E1.71: Nardus stricta acid grasslands
E1.72x: Semi-improved acid grassland
E5.31: Sub-Atlantic bracken fields
F4.13: Purple moor-grass wet heaths
F4.21: Sub-montane heath
G1.91: Oak/birch woodland
H5.37: Boulder fields
J4: Roads, tracks and hard standing

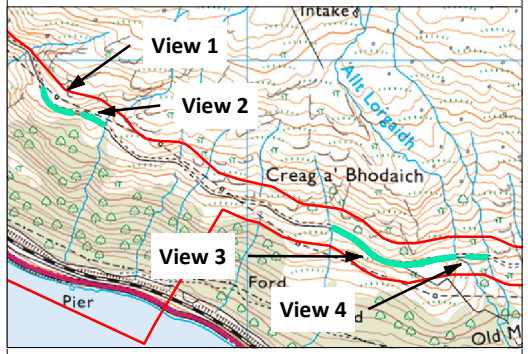


Figure A3

Map Scale @ A4: 1:1,000

Surveyed by: AEL	
Survey date: 2021	
Drawn by: RAH	
Checked by: Stantec	
Status: Final	

Applied Ecology Ltd

Cruachan 2

Loch Etive Woods Impacts - View 3b

Site boundary
Loch Etive Woods SAC
Revised SAC footprint

Habitats:

E1.71: Nardus stricta acid grasslands
E1.72x: Semi-improved acid grassland
E5.31: Sub-Atlantic bracken fields
F4.13: Purple moor-grass wet heaths
F4.21: Sub-montane heath
G1.91: Oak/birch woodland
H5.37: Boulder fields
H5.3: Rockfaces and other bare ground
J4: Roads, tracks and hard standing

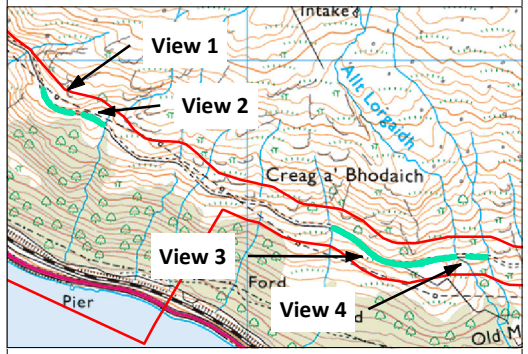


Figure A4

Map Scale @ A4: 1:1,000

Surveyed by: AEL	
Survey date: 2021	
Drawn by: RAH	
Checked by: Stantec	
Status: Final	

Applied Ecology Ltd

Cruachan 2

Loch Etive Woods Impacts - View 4

Site boundary
Loch Etive Woods SAC
Revised SAC footprint

Habitats:

E1.72x: Semi-improved acid grassland
E3.41: Humid meadows
E5.31: Sub-Atlantic bracken fields
F4.13: Purple moor-grass wet heaths
G1.91: Oak/birch woodland
H5.3: Rockfaces and other bare ground
J4: Roads, tracks and hard standing

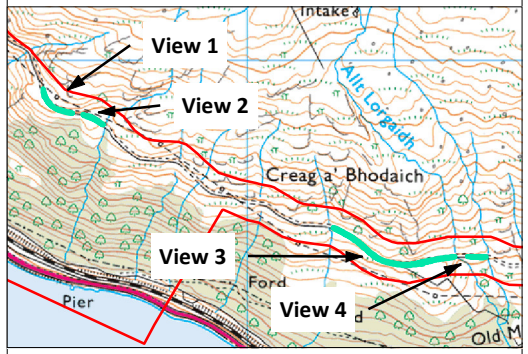


Figure A5

Map Scale @ A4: 1:500

Surveyed by: AEL	
Survey date: 2021	
Drawn by: RAH	
Checked by: Stantec	
Status: Final	

Applied Ecology Ltd

From: Szylak, Stuart <Stuart.Szylak@stantec.com>
Sent: 17 November 2022 14:17
To: Ruari Dunsmuir; McKenzie JR (James)
Cc: Fraser, Lynsey; Steve Marshall; Econsents Admin; Martin, Alexa
Subject: RE: ECU00004492 Cruachan Expansion NatureScot Comments
Attachments: Construction Traffic Response.pdf

Good afternoon Ruari,

Further to our meeting on Monday 14 November where you requested further information on likely construction traffic movements along the dam access road, I am pleased to attach a letter providing our response. The information has been collated from existing documents that support the application process, so nothing new, just distilled for ease of reference.

I trust that this will now enable NatureScot to withdraw the current holding objection.

Many thanks

Stuart

Stuart Szylak BSc(hons)
Associate Environmental Planner

Edinburgh (Charlotte Lane) SCT Office
stuart.szylak@Stantec.com

Mobile: +44 (0) 7843819022

Stantec

From: Szylak, Stuart
Sent: 25 October 2022 14:32
To: Ruari Dunsmuir <Ruari.Dunsmuir@nature.scot>; Alan.Brogan@gov.scot; James.McKenzie@gov.scot
Cc: Fraser, Lynsey <Lynsey.Fraser@stantec.com>; Steve Marshall <steve.marshall@drax.com>; Econsents_Admin@gov.scot; Martin, Alexa <Alexa.Martin@stantec.com>
Subject: RE: ECU00004492 Cruachan Expansion NatureScot Comments

Good afternoon Ruari,

Further to our site visit last month and your request for further clarifications I am pleased to attach the following for your information.

1) Marked up technical drawings (as used on site visit) to show more clearly the existing deer fence and SAC boundary, as these relate to the proposed widening works. We agreed on site that, in practice, the SAC boundary would be aligned tightly to the southern edge of the existing metalled road.
2) Provision of cross sections at key points, to show how widening and earthworks would sit in the topography. On site we agreed that at this bend, where topography drops away quite quickly, it would be useful for you to see how this encroachment into the SAC may look in profile. The previous commentary provided (see Q2 response in email trail below) regarding the stabilisation technique still applies.

3) Updated SAC impact report, including updated habitat loss calculations, based on the SAC boundary being aligned to the edge of the metalled road. As discussed on site, there will be a small encroachment into two areas where there is existing tree (birch) cover. The area of this encroachment has been calculated, in total along the whole length of the works, at 210m^2. The precise number of trees that could be lost as a result of the widening works is not yet known. Once a contractor is on-board and we know their precise construction methods and requirements we can be precise about what, if any, impact there will be on existing trees.

We trust that these clarifications will assist in your consideration and allow you to remove your holding objection of 5 July 2022.

Yours sincerely

Stuart

Stuart Szylak BSc(hons)
Associate Environmental Planner

Edinburgh (Charlotte Lane) SCT Office
stuart.szylak@Stantec.com

Mobile: +44 (0) 7843819022

Stantec

From: Ruari Dunsmuir <Ruari.Dunsmuir@nature.scot>
Sent: 30 August 2022 11:06
To: Martin, Alexa <Alexa.Martin@stantec.com>; Alan.Brogan@gov.scot
Cc: Rachel Hirst <rachel.hirst@appliedecology.co.uk>; Fraser, Lynsey <Lynsey.Fraser@stantec.com>; Szylak, Stuart <Stuart.Szylak@stantec.com>; Steve Marshall <steve.marshall@drax.com>; Econsents_Admin@gov.scot
Subject: RE: ECU00004492 Cruachan Expansion NatureScot Comments

Good morning

We would like to arrange a site visit with yourselves to discuss the issue in more detail in order to help us understand and gauge the potential impacts on the SAC/SSSI.

Current potential dates for us are: September - Tuesday 6th, Wednesday 7th, Tuesday 13th, and Wednesday 21st. Meeting 1030 earliest at a suitable location at the start of the access track, looking to walk the length of it, or enough of it for our purposes. Ideally we would like to ensure someone with knowledge in the road construction details is also present. I hope one of these days would be suitable, if you could let me know please.

Regards
Ruari

Ruari Dunsmuir | Operations Officer – West
NatureScot | Cameron House, Albany Street, Oban, Argyll, PA34 4AE | **m:** 07909 793 221
NàdarAlba | Taigh Chamshron, Sràid Albanaidh, An t-Òban, Earra-Ghàidheal, PA34 4AE
nature.scot | @nature_scot | *Scotland's Nature Agency* | *Buidheann Nàdair na h-Alba*

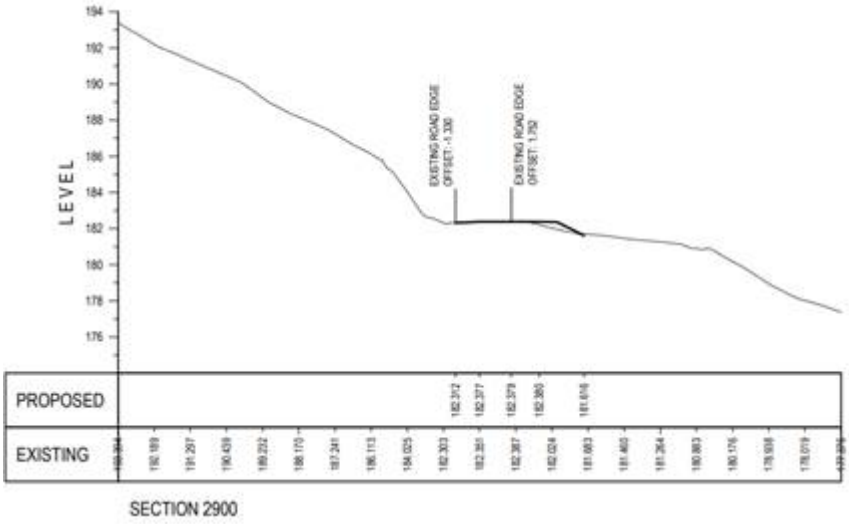
From: Martin, Alexa <Alexa.Martin@stantec.com>
Sent: 26 August 2022 16:37
To: Ruari Dunsmuir <Ruari.Dunsmuir@nature.scot>; Alan.Brogan@gov.scot
Cc: Rachel Hirst <rachel.hirst@appliedecology.co.uk>; Fraser, Lynsey <Lynsey.Fraser@stantec.com>; Szylak, Stuart <Stuart.Szylak@stantec.com>; Steve Marshall <steve.marshall@drax.com>; Econsents_Admin@gov.scot
Subject: RE: ECU00004492 Cruachan Expansion NatureScot Comments

Hello Ruari,

Further to your queries below, we have provided some additional information here on a point-by-point basis.

Q1: How much habitat will be lost to slope stabilisation along its entire length?
A1: As set out in our letter of 15 August 2022, 0.13 ha (1281 m^2), of the SAC/SSSI, of which 0.04 ha is existing access track, will be taken up for widening of the existing access track. The habitat loss calculations include the batter edges and land-take needed for stabilisation, as well as the track widening, as it is not possible to widen the track without that stabilisation due to the gradients involved. Within the 1281 m^2 there is 128 m^2 of habitat classified as oak/birch woodland, but this is all non-wooded verge albeit ecologically part of the woodland habitat mosaic.

Q2: How will stabilisation be achieved?
A2: There are 9 locations of proposed widening (see A4 below and attached maps). For all areas except Location 2 we are proposing to use standard earthwork slopes, up to a maximum of 1:2 slope to tie into the existing ground - see typical section below. We have focused all the widening to be in areas where no significant support would be required.



The exception to this is the ground around Location 2, which is highly constrained. At this stage of design, we assumed some widening either side of the bend where the earthworks would fit (see model extract below). However, if the extent of widening proposed is to be progressed it is likely that a structural solution would be required through this section to support the widening and also parapet replacement. The structure element has not yet been designed and may be of the form of gabion baskets/reinforced concrete retaining wall, sheet piles etc., all to be informed at the next stage of design by a structural engineer.

Q3: How much ground within the SAC will be affected by the stabilisation?
A3: The road widening cannot be achieved without vertical support to ensure slope stabilisation, and this is included in the habitat loss calculations previously provided and also set out in response to question 1 above – c. 0.13 ha, of which 0.04 ha is actually existing track.

Q4: Need detailed maps showing all of the places where widening/stabilisation needs to take place.
A4: The overview in the previously provided Figure 5 showed the nine locations where widening will be needed. These are shown in more detail on the attached diagrams.

Q5: Does the discontinuation of the traffic management system thereby require further track widening compared to the original scheme?
A5: The Traffic Management System was considered for the central section of the Dam access road (section 2 on below diagram) when we were looking at options for removing spoil from the upper reservoir area, but because of the topography adjacent the central section (both above and below the access road) it means that passing places cannot be formed without very significant engineering operations and there would be considerable safety implications. This and community consultation meant we then looked at alternative options for spoil removal for the upper intake.
The discontinuance of a TMS has not altered the requirement for passing places at the upper and lower sections and has not increased the extent of passing places/widening currently proposed.

I hope that this is helpful, but please do get back to us if you have further questions. In particular, we would be pleased to accompany you on a site visit if this would be useful.

Kind regards,
Alexa

Alexa Martin MRTPI
Senior Planner

5th Floor, Lomond House, 9 George Square, Glasgow G2 1DY
Direct: +44 (0)141 352 2377
alexa.martin@stantec.com

From: Ruari Dunsmuir <Ruari.Dunsmuir@nature.scot>
Sent: 18 August 2022 11:31
To: Martin, Alexa <Alexa.Martin@stantec.com>; Alan.Brogan@gov.scot
Cc: Rachel Hirst <rachel.hirst@appliedecology.co.uk>
Subject: RE: ECU00004492 Cruachan Expansion NatureScot Comments

Good morning

Thank you for the additional information.

The document includes some extractions from the overall length of the track to illustrate what is meant by route widening under three different scenarios, but doesn't provide details of how much habitat will be lost overall to slope stabilisation along its entire length, how this stabilisation will be achieved and how much ground within the SAC will be impacted by this, as well as a detailed map that shows all of the places where route widening/stabilisation needs to happen, so that we can fully analysis the impact on qualifying habitat.

Additionally, it is stated that the traffic management system is now no longer being considered. Given this was part of the original proposal, reducing the amount of track to be widened, does the discontinuation of the traffic management system thereby require further track widening compared to the original scheme?

Regards
Ruari

Ruari Dunsmuir | Operations Officer – West
NatureScot | Cameron House, Albany Street, Oban, Argyll, PA34 4AE | **m:** 07909 793 221
NàdarAlba | Taigh Chamshron, Sràid Albanaidh, An t-Òban, Earra-Ghàidheal, PA34 4AE
nature.scot | @nature_scot | *Scotland's Nature Agency* | *Buidheann Nàdair na h-Alba*

From: Martin, Alexa <Alexa.Martin@stantec.com>
Sent: 15 August 2022 17:52
To: Alan.Brogan@gov.scot
Cc: James.McKenzie@gov.scot; Econsents_Admin@gov.scot; Ruari Dunsmuir <Ruari.Dunsmuir@nature.scot>; David Maclennan <David.Maclennan@nature.scot>; Fraser, Lynsey <Lynsey.Fraser@stantec.com>; Szylak, Stuart <Stuart.Szylak@stantec.com>; Steve Marshall <steve.marshall@drax.com>
Subject: ECU00004492 Cruachan Expansion NatureScot Comments

Dear Alan

In response to the written consultee comments made by NatureScot to the above application, please find attached a letter containing further information to address and clarify the points raised by NatureScot in relation to the Loch Etive Woods Special Area of Conservation and the Coille Leitire Site of Special Scientific Interest. The response has been prepared following a meeting between Applied Ecology and NatureScot.

I would be grateful if you can please confirm receipt.

Regards,
Alexa

Alexa Martin MRTPI
Senior Planner

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Tha am post-dealain seo agus fiosrachadh sam bith na chois dìomhair agus airson an neach no buidheann ainmichte a- mhàin. Mas e gun d' fhuair sibh am post-dealain seo le mearachd, cuiribh fios dhan manaidsear-siostaim no neach- sgrìobhaidh.

ECU Ref: ECU00004492

17 November 2022

Stantec UK Limited
5th Floor, Lomond House
9 George Square
Glasgow
G2 1DY

(By email)

Dear Ruari

Response to NatureScot query about construction traffic expected to use the Dam access road.

Further to our recent meeting I am pleased to provide some further information regarding the subject above.

Construction Traffic

Access to the existing Cruachan Dam is achieved via a single track road ('Dam access road') with passing places. This road is accessed via St Conan's Road. Part of the proposed works are referenced throughout the Environmental Statement and other application documents as the 'Upper Control Works' and these will be located in proximity to the existing Dam.

The Upper Control Works will consist of building: a new intake structure including tower; screens; gates; and gate hoisting arrangement. These structures would be located within and adjacent to the Cruachan Reservoir to direct water into a new headrace tunnel and underground waterway system. Some rock excavations will be required on the shore of the reservoir to facilitate the works. There will also be an upgrade to the existing sub-station, accessed via St Conan's Road.

The Applicant has committed to not removing any spoil or rock from the Upper Control Works via the Dam access road. Instead, all spoil generated by the upper works will be dropped down the main tunnel shaft and penstocks and removed via the main access tunnel at Loch Awe. Whilst this significantly reduces the volume of construction traffic using the Dam access road there will still be a need to bring material, plant, equipment and construction workers to/from the Upper Control Works. A compound will be established, used for construction laydown and a concrete batching plant.

For assessment purposes the EIA assumed a peak, or 'worst-case' scenario, during the construction activity. The peak in construction traffic along the Dam access road is anticipated to occur in 2026 when the new intake structure will be built. During a 10 hour working day (8am to 6pm) expected daily vehicle movements associated with the Upper Control Works construction activities include the following:

- 12 x vehicle/ light goods vehicle trips related to construction worker/ contractors and equipment (equates to 24 movements);
- 8 x HGV trips for transporting plant, equipment, materials (equates to 16 movements); and
- 6 x 30-seater bus trips for transporting construction workers to the upper control works (equates to 12 movements)

It must be noted that this is the anticipated peak in construction traffic and once construction compounds are established and key plant is on site these numbers will reduce. Also note that construction impacts will be temporary in nature.

Air Quality

The formal Scoping Report, issued to the Energy Consents Unit for opinion, contained the following statements regarding potential air quality impacts:

"*Potential receptors which may experience adverse effects in terms of air quality include Glen Etive and Glen Fyne SPA, Coille Leitire SSSI and Loch Etive Woods SAC.*

The construction phase has the potential to generate the following effects on local air quality:

- *Increased nitrogen dioxide (NO2) and fine airborne particle (PM10 and PM2.5) concentrations from road traffic; and,*
- *PM10 and dust effects from construction activities, including engineering works and the potential working of borrow pits (referred to collectively as 'construction dust impacts').*

Overall, it is considered that the potential air quality effects associated with the Proposed Development are not likely to be significant and should be scoped out of the EIA."

In its formal Scoping Opinion ECU stated "*Scottish Ministers agree that air quality should be scoped out of the EIA."*

We trust that the above information will allow you to consider and prepare your response as soon as possible.

Yours Sincerely,

Stuart Szylak
Associate Environmental Planner
on behalf of Stantec UK Ltd

Further Environmental Information

Appendix 4 Transport and Access

Document Title:	Cruachan 2 – Post-Application – Responses to Transport Scotland (Gerard McPhillips) comments 22 July 2022		
Original Doc No	n/a	**Date:**	31/08/2022
Response Doc No	n/a	**Review Date:**	

Item	Comment Received	Internal Review & Response from Stantec Transport Team
1	*Transport Scotland would request an updated project overview is presented by the applicant outlining the construction process proposed etc., so that we can be sure that we are looking at most up to date proposals.*	An updated project overview will be presented to Transport Scotland by Drax/ Stantec at the upcoming meeting.
2	*The information to date suggests that spoil from the proposed new tunnels could generate around 2.3 million tonnes of excavated rock over the projects 5.5 year build, however only a relatively small proportion of this is to be retained on site to be incorporated within the works. Confirmation is therefore required on how this material will be transported, utilised and disposed of. This should consider all potential modes for transporting material, including rail or water borne options and take due account of relevant sustainability issues.*	The Transport Assessment includes a worst-case scenario, and the amount of excavated material could be considerably less than the 2.3 million tonnes reported. It should be noted that 2.3 million tonnes represents the gross weight of excavated material. The net weight of the excavated material would be 1.8 million tonnes (worst-case) once reuse of material for the quayside uplift is taken into account. Further details of how the material will be used onsite will be presented to TS at the upcoming meeting. Transporting the excavated material by rail or marine options have been considered and excluded. There are no suitable rail freight facilities within the vicinity of the Site and establishing new freight facilities at Loch Awe would have significant land constraints and could result in significant environmental impacts. Also, at the public consultations held, there has been public opposition to rail handling of material. Regarding marine options, there are no suitable marine to land interface facilities available at Loch Awe, and it has no connecting navigable waterways. Regarding the destination for the unused excavated material, Drax are currently in detailed discussions with local quarries so that the material can be kept in a local stockpile for future beneficial use for other

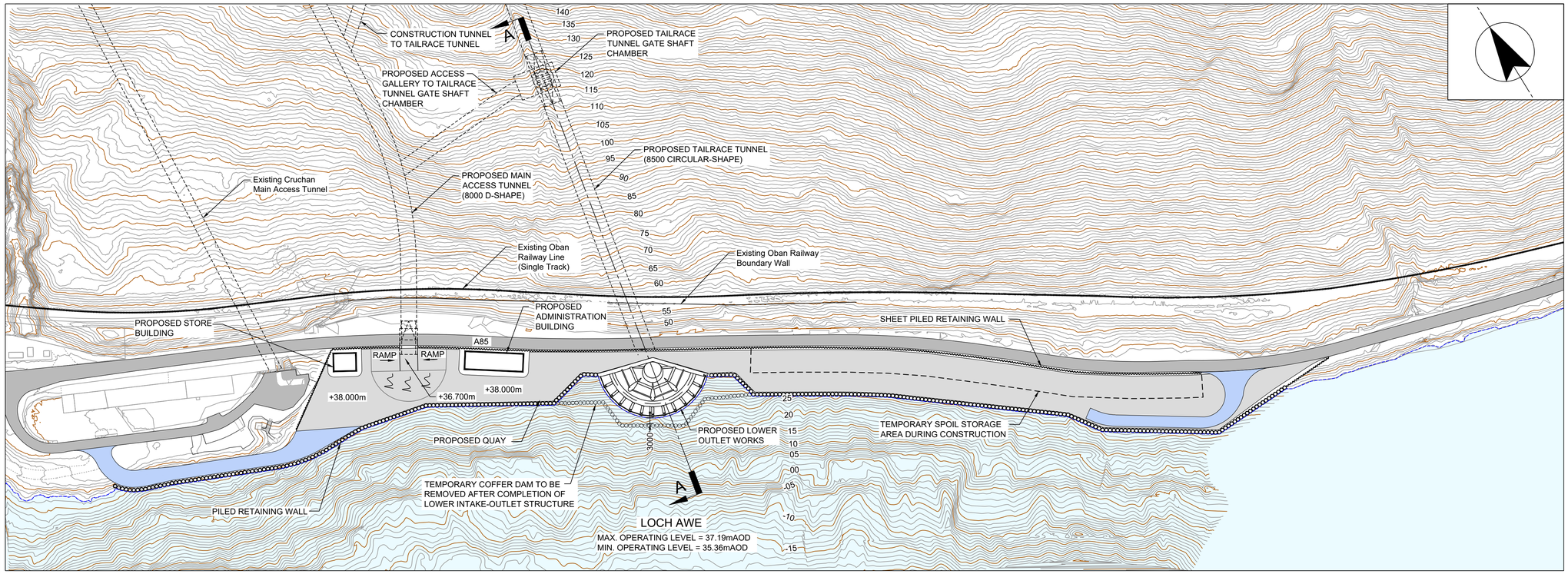
Item	Comment Received	Internal Review & Response from Stantec Transport Team
		infrastructure projects. Further details can be provided to TS once an agreement is reached, and the information can be shared publicly.
3	*The latest proposals suggest that the majority of this material will now be removed by road. Removal of this material by road alone may impact on the structural integrity of the trunk road network. A programme of Before / During / After Dilapidation surveys will require to be agreed and undertaken and Transport Scotland would require the applicant to enter into a Legal Agreement under Section 96 of the Roads Scotland Act 1984 (Extraordinary Damage to Road), whereby the applicant agrees to pay the costs of such damage attributed to their works. Transport Scotland would likely request a condition to this effect was included in any Planning Consent granted which would be subject to both parties agreeing a suitable sum of money or mechanism for repair of the damage. The extent of any such dilapidation surveys would need to be agreed between Drax and Transport Scotland.*	It is agreed that a condition of acceptance would be appropriate and Stantec would work with TS to scope and agree the process and extents of the review and monitoring.
4	*Rather than the realignment of the A85 to the south (onto a jetty across Loch Awe) originally proposed, the A85 temporary diversion is now proposed through the layby to the north - immediately adjacent to the railway embankment, with one-way traffic signal operation estimated for up to 4 months. Clearly, this would cause significant disruption to the trunk road (and local road) network and this is not something Transport Scotland would generally accept, unless it can be demonstrated that there are no feasible alternative options. The preferred option would be to maintain of two-way traffic movements. The A85 experiences seasonal flow variations and there would likely be restrictions on when and for how long temporary traffic management would be permitted. Any diversions / realignments, particularly those intended to be in place for an extended duration of time, would require to be designed in accordance with appropriate design standards to an appropriate design speed. Transport Scotland would therefore request a detailed option appraisal report that outlines all the options which have been considered – including the original option to divert / realign the A85 onto a jetty across Loch Awe, to allow an informed decision to be made on the most appropriate solution and how best this could be managed.*	To establish a link to the main access tunnel works from the shore line of Loch Awe, an 8-metre diameter access tunnel is required to transport the transformers to the transformer galleries which form part of the underground power station complex. This requires a route to be constructed across the alignment of A85 in order to provide sufficient diameter and headroom to the main access tunnel having regard to Loch Awe water levels. The option to divert A85 to the south on to the quayside was initially considered as part of the scoping for the project and was further analysed during the development of the submission. That proposal was concluded not to be appropriate or practical as it would require importing approximate 350,000 tonnes of material onto the quayside to facilitate the road diversion. This would result in significantly more traffic on the road network and would result in a significantly longer construction programme, and introducing increased risk to road users using the diverted corridor. The option to form a corridor under the current alignment of A85 was therefore developed and uses a cut and cover approach where A85 is temporarily diverted in phases during the construction of the underpass. That approach is adopted within the Transport

Item	Comment Received	Internal Review & Response from Stantec Transport Team
		Assessment and the submission and included swapping the tailrace and access tunnels routes to facilitate the change in approach. The temporary realignment of A85 will be done during the winter months and Drax will work with TS to agree the timing and nature of the realignment and traffic management. It should be noted that the TA includes an assessment of signal-controlled shuttle working (alternate way traffic management) based on 2017 traffic flows uplifted to year 2027. This analysis shows very minor levels of queuing and delay. Further details will be provided to TS as part of the upcoming meeting with TS.
5	*If we accept running the A85 diversion works so close to the bottom of the slope, the stability of the slope above the diversion works will need to be assessed and along with any implications for the Network Rail infrastructure above.*	The assessment of slope stability will be carried out pre-construction and is required as part of the asset agreement with Network Rail. This could be additionally secured through a planning condition, if necessary, albeit that would effectively be a duplication of consent.
6	*Transport Scotland will also need details of the structural design [certification?] and a construction methodology for any tunnel under the Trunk Road for our structure colleagues to review in terms of the overall project. It is likely that Approval in Principle for all structures will be required with Design check certification etc. to be agreed with Transport Scotland.*	It is appropriate that the structural design details will be provided at detailed design stage and agreed through a pre-construction planning condition applicable to any tunnel which would affect A85 trunk road.
7	*It is stated that the above diversion of the A85 is required to build the main bridge structure / access tunnel under the A85. The project layout plan attached, shows construction of a tailrace tunnel to the north of this under the A85, yet no proposed diversion. Clarification is required on how this will be built without a road closure.*	The tailrace tunnel will be located approximately 50 metres below the road level and, as it is a tunnel under A85 with sufficient cover available above it. Its construction will not affect the safe operation of A85. Drawing 331201086/01/C/0901 (copy attached below) included as part of the Section 36 shows the cross-section of the tunnel in relation to the road. As noted above, the construction method for the tailrace tunnel is different to the main access tunnel where it sits much lower than the access tunnel and will be constructed without directly influencing the alignment of A85. If required, assurance could be provided to TS that the construction of the tailrace tunnel will not affect the structural integrity of A85.
8	*Construction of the gate shaft and access gallery connecting the two new tunnels is located approximately 120m above trunk road level. This could present potential safety issues to road and rail users whilst*	The gate shaft and access gallery will be located deep within the ground and the connection points between the tunnels will be at least

Item	Comment Received	Internal Review & Response from Stantec Transport Team
	works are ongoing. Detailed risk assessments and proposed mitigation will be required for all works on the hillside above the Trunk Road and Transport Scotland would wish to see and approve these as part of the application process.	40 metres below ground surface with construction all being carried out below the surface. Drawing 331201086/C/0902 (copy attached below) included as part of the Section 36 application and shows the cross-section for the tunnel at this point.
9	*Ground investigation and Geotechnical certification may be required for works on the hillside. Has the stability of the slope been analysed? Input from Transport Scotland's Geotechnical Engineer is likely to be required here.*	Ground investigation and Geotechnical certification will be secured and agreed through a pre-construction planning condition.
10	*Only limited details have been received to date regarding abnormal load movements and how these will be managed. Additional information and clarification of the current AIL proposals is therefore sought.*	A high-level Abnormal Indivisible Loads (AIL) Assessment has been included as part of the TA, reflecting the current level of detail on anticipated large loads for the project. This highlights potential AIL routes, high-level height/ width/ weight constraints and swept path analysis of a 100t transformer at key pinch points. It should be noted that many of the larger pieces of equipment will be transported to site as normal loads and assembled on site, reducing the number of AILs arriving or departing from site during the construction period. The 100t transformer is therefore an appropriate assessment load as it is the largest indivisible load anticipated for delivery to site. A detailed route assessment would be undertaken at a later stage once the specification/ dimensions of the loads are known and following the appointment of the haulage company who will determine the required vehicle and trailer arrangements. The haulier will be responsible for submitting the AIL notifications to TS and other stakeholders through the standard submission process. If there are specific points relating to the AIL strategy that TS would wish to discuss, Drax would be happy to arrange a meeting on that topic.
11	*A timetable of the proposed works, including any works potentially impacting on the A85, is requested e.g. the temporary diversion works, any potential shuttle workings, HGV spoil movements etc.*	There is an ambition to commence construction in 2025 and completion in 2030. However, until an EPC contractor is appointed, the exact phasing of the works is not known.

Item	Comment Received	Internal Review & Response from Stantec Transport Team
		An indicative high-level programme and phasing of works will be provided to TS.
12	*Transport Scotland will also require appropriate drawings of the A85 access proposals (temporary and permanent) which can be referred to in any planning Conditions etc. Alternatively, it may be possible to Condition things along the lines of 'prior to commencement of development detailed design and specification for all access works required to be submitted to and approved etc.' Further discussion etc. is required on the most appropriate approach going forward.*	The A85 access proposals at the required level of detail will be provided to TS at detailed design stage and secured through a pre-construction planning condition.

Attachments



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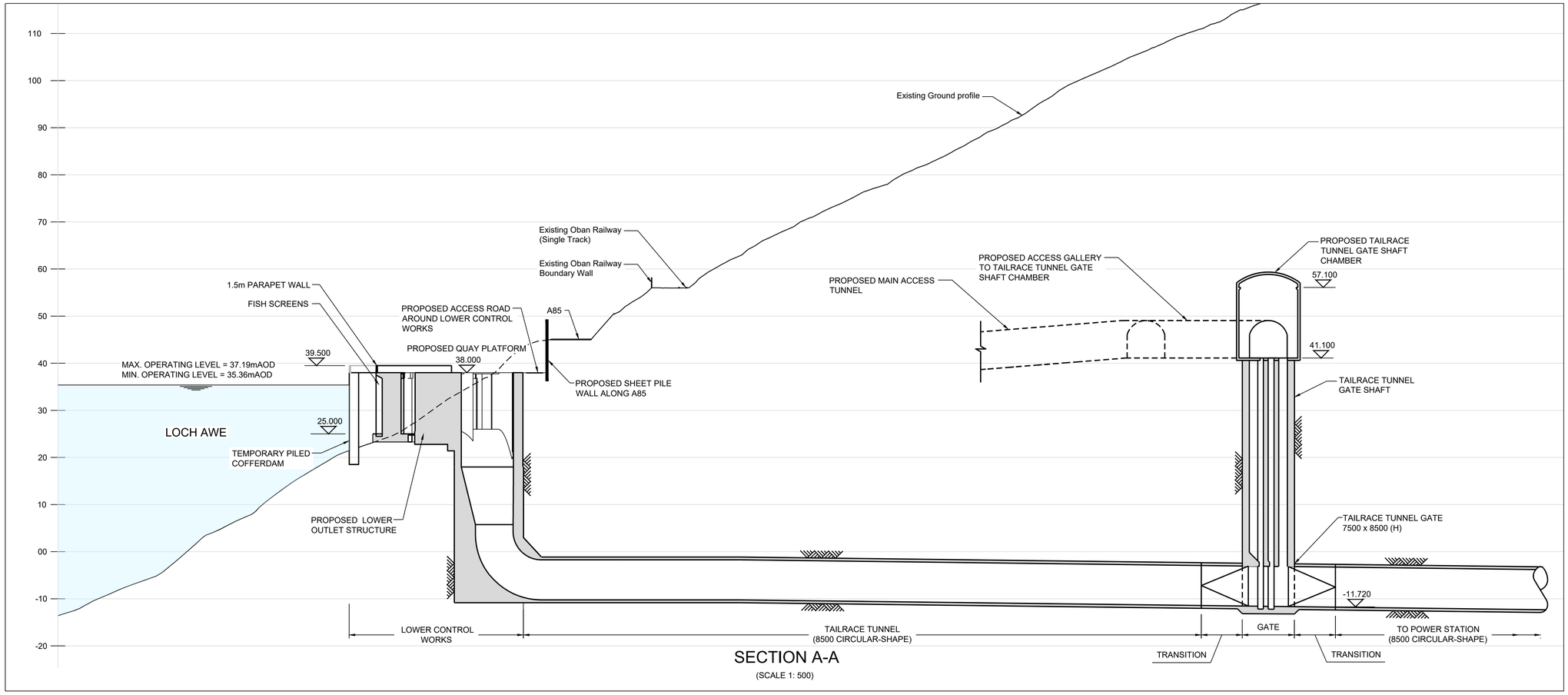


SECTION A-A
(SCALE 1: 500)

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES UNLESS SHOWN OTHERWISE.
2. THIS IS A CONCEPT PHASE DRAWING TO ILLUSTRATE THE PROJECT BASE CASE. ALL DIMENSIONS AND ELEVATIONS ARE APPROXIMATE AND WILL BE REVIEWED AND UPDATED AS PROJECT DESIGN STUDIES CONTINUE. ALL CONCEPTS, DETAILS, DIMENSIONS AND ELEVATIONS INDICATED ON THIS DRAWING WILL REQUIRE FURTHER REFINEMENT DURING A SUBSEQUENT DESIGN PHASE.

LEGEND

- Existing Road
- PROPOSED QUAY AREA
- ACCESS TO QUAY

SCALE 1 : 1250
m50 0 50m

SCALE 1 : 500
m10 0 40m

CURRENT VERSION INFORMATION

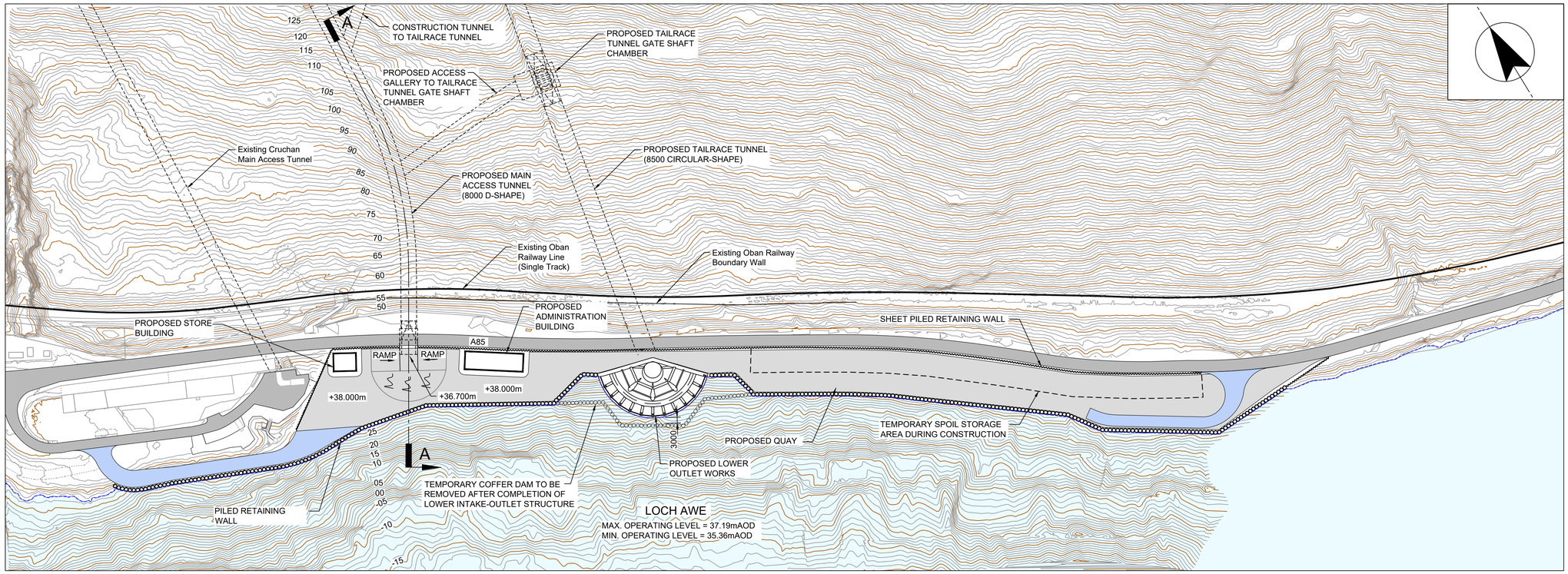
C. PROPOSED STORE AND ADMINISTRATION BUILDING RELOCATED. TEMPORARY SPOIL STORAGE AREA ADDED.

DATE	DRWN	CHKD	REVD	VER	REASON FOR ISSUE
10.03.22	MD	SS	CS	C	FOR INFORMATION
28.02.22	PPS	SS	CS	B	FOR INFORMATION
11.02.22	PPS	SS	CS	A	FOR INFORMATION

DRAX CRUACHAN EXPANSION LTD
CRUACHAN 2

LOWER CONTROL WORKS
TAILRACE TUNNEL
PLAN AND SECTION

CONTRACT NO.	SCALE	MASTER SIZE
01	AS SHOWN	A1
DRAWING NO. 331201086/01/C/0901		VERSION C



PLAN
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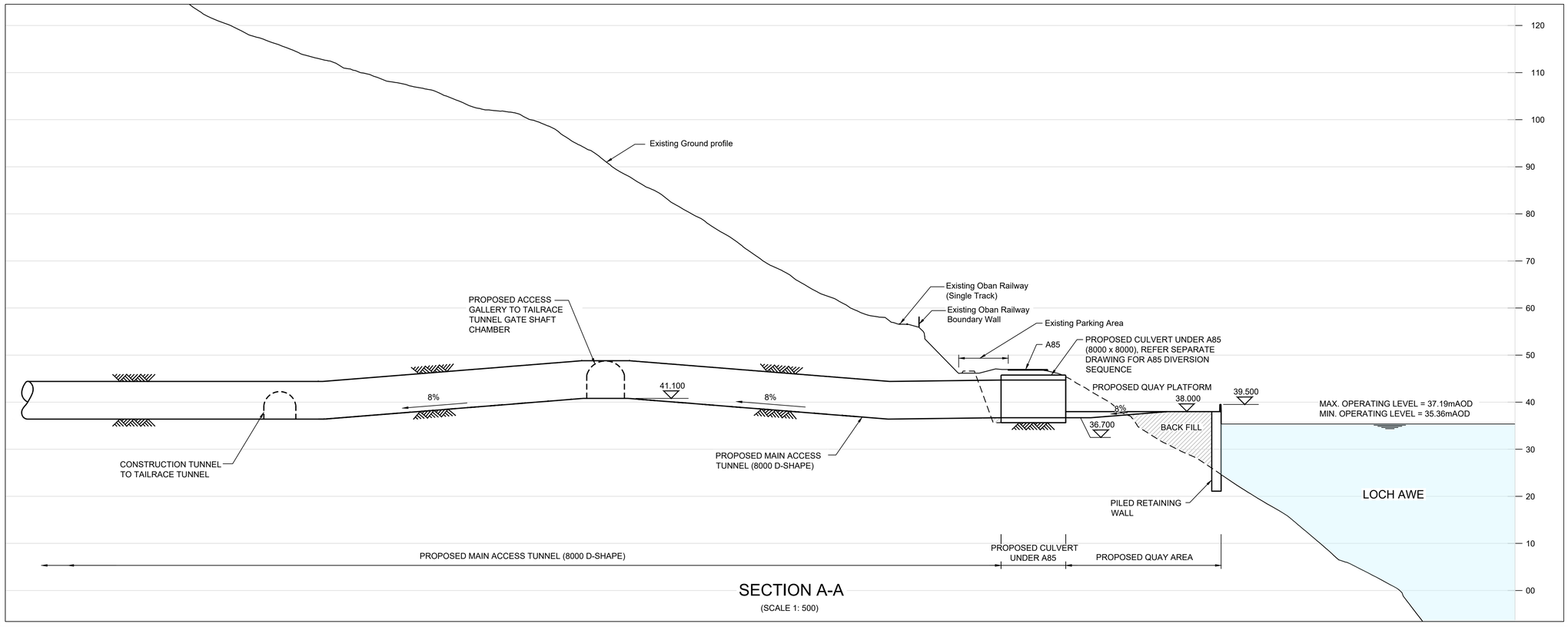

SECTION A-A
(SCALE 1: 500)

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LEGEND

- Existing Road
- PROPOSED QUAY AREA
- ACCESS TO QUAY

SCALE 1 : 1250
m50 0 50m

SCALE 1 : 500
m10 0 40m

CURRENT VERSION INFORMATION

C. PROPOSED STORE AND ADMINISTRATION BUILDING RELOCATED. TEMPORARY SPOIL STORAGE AREA ADDED.

DATE	DRWN	CHKD	REVD	VER	REASON FOR ISSUE
10.03.22	MD	SS	CS	C	FOR INFORMATION
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11.02.22	PPS	SS	CS	A	FOR INFORMATION

DRAX CRUACHAN EXPANSION LTD
CRUACHAN 2
LOWER CONTROL WORKS
MAIN ACCESS TUNNEL
PLAN AND SECTION

CONTRACT NO.	SCALE	MASTER SIZE
01	AS SHOWN	A1
DRAWING NO. 331201086/01/C/0902		VERSION C

TECHNICAL NOTE

Job Name: Cruachan 2

Job No: 50355

Note No: C2TN1

Date: 09 November 2022

Prepared By: Kieran Mann

Subject: **Construction Materials Handling Review – Consideration of Marine and Rail Transport Opportunities**

1. Introduction

1.1. Since the submission of the Cruachan Expansion project and associated Transport Assessment (TA), Transport Scotland has requested further information regarding the transportation of associated excavated and bulk material from the project.

1.2. Transport Scotland has provided comment on the impacts from the HGV movements associated with the removal of the excess excavated construction material from the tunnel. Further information on the high-level appraisal of alternative strategies, being marine- and rail-based has been requested.

1.3. This Technical Note is set out to provide further commentary for removing the excess excavated construction material and the consideration of adopting marine- and rail-based transport solutions. Following this, the previous advice included in the TA is reiterated with regard to the proposed material handling strategy.

1.4. The construction phase of the Cruachan Expansion project will take place over an estimated 65-month programme from 2025 to 2030, assuming consent is granted, and work commences in 2025. The following construction activities are expected to coincide during this period:

- Exporting excavated material to stockpiling locations
- Transport of concrete from the lower site construction compound to the Lower Control Works site
- Upper Control Works site construction activity related to the formation of the upper intake structure, waterway tunnels and excavated material removal

1.5. It is expected that there will be approximately 2.3 million tonnes of excavated material from the proposed excavation, with approximately 0.5 million tonnes of that material to be re-used to assist with the construction of the project, with the remaining 1.87 million tonnes requiring transportation to a designated off-site material storage site.

DOCUMENT ISSUE RECORD

Technical Note No	Rev	Date	Prepared	Checked	Reviewed (Discipline Lead)	Approved (Project Director)
C2TN1	1	09/11/22	KM	KM	AN	AN

2. Marine Transport Consideration

2.1. This section details the initial considerations of potential options for a marine-based transportation strategy to remove excess excavated construction materials from the project and explores the expected requirements and impacts.

2.2. Accommodating facilities adjacent to A85 at Loch Awe have been reviewed by the design team as a potential process to ensure efficient transfer of the excavated material to barges moored alongside a new wharf. The provision of a processing and loading facility would require the provision of a level site with a safe and appropriate mechanism to transfer the material from the land-based site vehicles to barges – typically a conveyor system or crane / materials handler. To achieve a level site of the required size and configuration for marine to land interface, more complex filling, profiling and piling of the foreshore at Loch Awe would be required. Given the bathymetry of the Loch (i.e. very steep sided at the worksite area), this processing and loading facility would require the filling of substantial volumes of material into the existing Loch. Preliminary estimates have identified that approximately 350,000 cubic metres of fill would be required to achieve a suitable level site. This would be equivalent to approximately 30,000-35,000 loads of material within standard road going tipper vehicles. Whilst some material could be acquired from the creation of the access tunnel, that material would need to be removed by road on decommissioning. A significant quantum of material would always be required to establish the initial operations for the creation of the access tunnel.

2.3. Given the need to ensure this facility is available prior to the commencement on the main works of the site, all HGV movements to import this fill would be required within a short timeframe. Similarly, upon completion of the project, this site and wharf will likely require repurposing or removal, depending on the agreed strategy. Should it be removed then all HGV movements associated with its removal again will occur over a short timeframe, separate to the main construction programme.

2.4. Further to the creation of a new wharf at the work site, a transhipment facility would be required at the off-loading location, which in turn would require road-going construction vehicles for the build and decommissioning. It is unlikely that a legacy facility would be created. No estimation has been made of the likely off-loading point – location or quantum of material since no obvious location was found and public consultation showed strong opposition to such a facility at Lochawe village and station.

2.5. Loch Awe is a land locked body of water (in terms of navigability) with limited facilities available for use of loading and off-loading for barges. Should excavated material be transported within the loch, then there will be the need to provide an additional facility to remove the material from the barge. As the receiving quarries would not front on to the loch, this excavated material will then require transfer to the rail or highway network for the completion of the final leg of the journey to any quarry or other receptor site. As there is currently no facility to support this transfer, sites have been investigated in the loch close to suitable onwards land-based transport connections.

2.6. The most suitable location identified is adjacent to Kilchurn castle where there may be space to accommodate facilities to connect into A85 or for a rail siding to be created. Currently the water depth in this location is not suitable for navigation by barge and would require either dredging to create a suitable navigable or an alternative transhipment process from deeper waters. This facility is likely to require adjustments to the existing water's edge to accommodate a barge landing and for the processing of material. The excavated material would then be able to be transferred to rail or the highway network but with setting impacts on the Kilchurn castle heritage environment.

2.7. Should the material be transferred to the highway network, a junction will be required with A85. This will also result in the same number of HGV movements as if the trips were completed from the excavated site. The journeys could be marginally shorter journeys if the material is to be stockpiled to the east or south of the Cruachan worksite. There would be no logic to a marine to road transhipment point to the east of the worksite if the material were then transported by road back past the worksite – e.g. towards Oban.

2.8. Should the material be transferred to the rail network, the provision of a rail siding (explored further in the Rail Transport Considerations section) will be required along with a conveyer belt between the barge landing and the train or an HGV suitable road to carry the material between the barge and the train. The establishment of a rail passing loop and a rail siding to support the transfer of materials onto trains will be required at the rail transfer facility.

2.9. There also would be the need to ensure these facilities were available prior to the commencement of the main construction works programme. The HGV movements associated with construction of these facilities would be required to be made within the short construction timeframe prior to the main construction programme (as to not hold up construction). Similarly, upon completion of the project, these facilities would likely require repurposing or removal, depending on the agreed strategy. Should they be removed then all HGV movements associated with their removal again will occur over a short timeframe by road, separate to the main construction programme.

2.10. A preliminary review of this strategy has identified the following impacts:

- **Environmental impacts**
  - The construction and decommissioning of the marine interface facilities would require significant quanta of road movements of material, offsetting saving in road mileage that might have been derived by the marine operation
  - environmental and safety savings from the use of a marine operation, would be quickly eroded due to the need to tranship material between the marine and a rail or road operation for onward transportation
  - The impacts to Loch Awe where the creation of a wharf would be required to accommodate the loading facility is likely to be significant with lasting impacts, irrespective of whether the facility is retained or removed after completion
  - The impacts to Loch Awe and the land adjacent where the unloading facility will be provided is likely to be significant
- **Social impacts**
  - Residents of Awe and surrounding communities have shown resistance to a marine logistics operation on Loch Awe
  - The provision of the loading facility adjacent to the existing visitor centre may allow for future expansion of the facility, should the reclaimed land be retained improving the social value of the site
  - The provision of the unloading facility adjacent to Kilchurn castle is likely to have visual impacts, impacting the heritage and cultural setting of the castle
- **Economic impacts**
  - The cost of providing these facilities combined with the expected usable life of them is not considered to be adequate to justify the expected outlay
  - There will still be a significant number of HGV movements associated with the provision of these facilities and with the final legs of the journeys, potentially on the Transport Scotland highway network resulting in infrastructure degradation over and above a solely road-based operation

2.11. In addition to these impacts, other concerns lie with a marine-based transportation solution:

- The potential engineering feasibility of constructing an open and level facility within the loch has not been considered in detail by the design team and may prove to be unfeasible
- The proposed strategy to transfer the excavated material to a local quarry is not congruent to such a convoluted treatment. A marine-based transportation would be considered more appropriate for longer distance journeys or where significant impediments limit the use of the highway network

3. Rail Transport Considerations

3.1. This section details a rail-based transportation strategy to remove excess excavated construction materials from the project and explores the expected requirements and impacts.

3.2. Given the lack of open and level land adjacent to the proposed extraction site and rail line, the provision of a new facility to prepare the material for transport and loading onto trains would be required. Two options have been considered in this appraisal. One sited away from the excavation site where suitable open and flat land is available. The other option considered the provision of a facility adjacent to the extraction site. Both options are likely to require a passing train loop to ensure through-train services can be maintained on this section of track while the freight trains have the material loaded.

3.3. The provision a facility sited away from the excavation site has been considered adjacent to Kilchurn castle. This facility would require the construction of a new rail siding, train passing loop and highway connections to allow HGVs to run from the excavation site to this facility.

3.4. The provision of the loading facility away from the excavation facility will require HGV movements to be made between these two sites for the life of the project. This will require the same number of HGV movements when compared to an HGV based solution, albeit relatively short shuttle movements from the worksite to the rail loading facility. There also will be the need to ensure this facility is available prior to the commencement of the main construction works programme. The HGV movements associated with construction of the facility would be required to be made within the short construction timeframe prior to the main construction programme (as to not hold up construction). Similarly, upon completion of the project, the facility will likely require repurposing or removal, depending on the agreed strategy. Should it be removed then additional HGV movements will need to occur to support the removal of the facilities.

3.5. An alternative proposal that was considered was that of creating a rail transhipment location at Lochawe station or within the vicinity of the access tunnel near Falls of Cruachan station. The facility at Lochawe station was strongly resisted by local stakeholders and would require extensive and complex design to create a viable rail interchange. Given the constrained land availability between the rail line at Falls of Cruachan and the loch due to A85 being located close to the trainline it will be necessary to cut into the steep slope of Ben Cruachan to provide an open and level site to accommodate a train passing loop and the processing and loading facility. The design of such a facility would be extremely challenging and damaging to the setting of the mountain, whilst this area is also designated as a Site of Special Scientific Interest and forms part of the Loch Etive Woods Special Area of Conservation.

3.6. No estimates have been taken of the likely requirement of material to be excavated from the slope; however, it is considered likely that there would be a significant level of excavation required to create a viable freight transhipment and loading facility within the slopes of Ben Cruachan. There would be a requirement to form a bridge crossing over the railway line for HGV's to access the loading facility with the need for an access to be created on to the A85. There also would be the need to ensure this facility is available prior to the commencement of the main construction works programme. The HGV movements associated with excavation of the slope for the facility would be required to be made within the short construction timeframe prior to the main construction programme (as to not hold up construction). Upon completion of the project, remediation works would be required, depending on the agreed strategy. This would involve reinstating the slope to its original state to ensure its ongoing stability and would require significant fill material.

3.7. In both instances, there would be the need to unload the material from the trains at its destination to transfer it to the end user or quarry for storage. To support this transfer of materials, a rail siding will also need to be constructed at the destination or close to the quarry, conveyor, or where HGVs are able to load the material to transfer it to the quarry or end user.

3.8. A preliminary review of these strategies has identified the following impacts:

- **Environmental impacts**
  - The impacts to Ben Cruachan where the cutting would be required to accommodate the loading facility would be significant with lasting impacts, irrespective of whether the land was returned to its previous state

    - Rail asset protection and possessions would require long lead-ins and complex negotiations with Network Rail and the Train Operating Companies
    - The impacts to Loch Awe and the land adjacent where the unloading facility would be provided would be significant as well
- **Social impacts**
    - The provision of a loading facility adjacent to Kilchurn castle would have visual impacts, impacting the cultural setting of the castle
- **Economic impacts**
    - The cost of providing these facilities combined with the expected usable life of them is not considered to be adequate to justify the expected outlay
    - There will still be a significant number of HGV movements associated with the provision of these facilities, with the transfer of material from the excavation site to the rail loading facility (where applicable for the first option) and with the final legs of the journeys, potentially on the Transport Scotland highway network resulting in infrastructure degradation

3.9. In addition to these impacts, other concerns lie with a rail-based transportation solution:

- Local stakeholders and the rail operator have not been supportive of adopting this type of solution in previous consultation rounds and during exhibition of materials
- The potential engineering feasibility of constructing an open and level facility within the lower slopes of Ben Cruachan has not been considered by the design team and may prove to be unfeasible
- The proposed strategy to transfer the excavated material to a local quarry is not congruent to such a convoluted treatment as rail-based transportation would be considered more appropriate for longer distance journeys or where significant impediments limit the use of the highway network

4. Materials Handling Strategy – As Submitted

4.1. Initial discussions have commenced with local quarry operators to receive this exported material. The quarries are expected to be located locally to the worksite, as further distances have a greater environmental impact and will reduce economic feasibility of transportation. The material is likely to be processed at the recipient stockpile location. This material would be able to then be used as a part of the existing recipient quarry operations, exporting it for use for other projects in the longer term.

4.2. The exported material to be taken off-site will be transported by road over an anticipated 54-month programme. The peak off-site haulage is expected to be about 2,987 tonnes / day and expected to occur in Year 2. It should be noted that the proposed construction start is currently anticipated to be 2025. The average haulage is expected to be about 1,525 tonnes / day. This figure includes allowance for a proportion of excavated materials being used for concrete lining and to create the quayside build-out.

4.3. Distribution of the exported material vehicle movements that will be generated during the construction phase is dependent upon the stockpiling destination. Given the ongoing discussions with quarry operators, the final destinations are still to be confirmed. The TA distribution strategy is still considered relevant. Two scenarios for the distribution of the traffic movements associated with the exported materials have been assessed:

- Scenario 1: 100% of traffic movements distributed to the east of the site along the A85 and onto the A82 southwards
- Scenario 2: 100% of traffic movements distributed to the west of the site along the A85

4.4. Percentage impacts on the links close to the worksite across both scenarios are reported with the TA range between 1% and 24%. Notwithstanding this, it is evident that the directional vehicle movement generation values are generally very low, and the percentage impact values are the result of very low hourly background traffic flows (relative to the link capacities). As such, the traffic associated with the peak in construction traffic would not result in any highway capacity impacts on the surrounding highway network.

4.5. A detailed Construction Traffic Management Plan (CTMP) will be prepared and implemented prior to the construction stages of the development to ensure that construction is undertaken in a way that will minimise its impacts as far as is practical upon the local community and transport network.

4.6. The key objectives of the CTMP would be to:

- Set out the details of the construction processes for the works covered by that CTMP
- Minimise impacts of the construction stages on the local community and transport network
- Lower emissions from the traffic associated with those construction processes
- Enhance traffic safety and awareness – with an emphasis on vulnerable road users
- Identify the site boundary and study areas specific to that CTMP
- Provide information on traffic routeing and site access
- Provide an indication of programme and key dates and the associated predictions of construction vehicle movements
- Identify other mitigation measures, such as vehicle, haulier and driver standards requirements
- Indicate the competencies and accreditation required for staff associated with the movement and management of site traffic
- Set out the requirements for AIL movement management and consenting
- Identify temporary traffic management, waiting and loading controls and parking suspensions and
- highway licences and approvals required to undertake the works safely and efficiently

4.7. The following potential measures have been identified to help the appointed contractor achieve the goals of the CTMP:

- Construction vehicle management systems
- Equipment management systems, including minimising plant swap-outs and optimising
- maintenance regimes
- Haulier standards in safety and vehicle standards
- Adherence of construction HGVs to designated routes
- Timing of the excavated material removal HGV movements
- Reuse of materials onsite
- Co-ordination of vehicle movements between the existing and the expanded power station facilities (e.g. maintenance and delivery vehicles)
- Implementation of construction staff travel plan

4.8. A programme of before / during / after road condition surveys will be agreed with Transport Scotland, with it expected to be conditioned that the applicant enter a Legal Agreement under Section 96 of the Roads Scotland Act 1984 (Extraordinary Damage to Road), whereby the applicant agrees to pay the costs of such damage attributed to their works. The adoption of this strategy is intended to ensure impacts on the structural integrity of the trunk road network are managed.

5. Summary and Conclusion

5.1. Transport Scotland has requested additional information is provided to understand option considerations of marine- and rail-based transportation solutions as an alternative to transporting the excess excavated construction material from the tunnel to external storage facilities or end users. This is requested to assist with understanding the purpose for adopting HGV based movements as the sole way to export material from the site.

5.2. A marine-based transportation strategy has been explored to set out how excavated material could be transferred from the excavation site by barge. The envisaged option involved the provision of a loading facility adjacent to the excavation site and the provision of an unloading / transhipment facility at Kilchurn castle.

5.3. The likely impacts of the undertaking of this strategy would include. the environmental impacts are likely to be significant given the need to infill a stretch of the loch and undertake earthworks near Kilchurn castle to load and unload the barge and interact with the ongoing transport mode. The societal impacts are likely to be of benefit, with the potential to expand the footprint of the existing visitor centre near the excavation site, however, near Kilchurn castle, the visual impacts are unlikely to be acceptable to the existing cultural setting. The economic impacts associated with the costs of these facilities and the inefficient use given the short useable lifetimes are of note.

5.4. A rail-based transportation strategy has been reviewed to understand how excavated material could be transferred from the excavation site by train. Two options were assessed, one involving the provision of a rail siding and associated infrastructure where existing open and flat land exists, near Kilchurn castle, and through the provision of a rail siding and associated infrastructure in a cutting into the existing slope of Ben Cruachan adjacent to the tunnel excavation site or near Lochawe station.

5.5. With the provision of the loading facility away from the excavation site, there will still be the need to transfer the excavated material from the excavation site by HGV with a similar number of trips, albeit shorter distance trips or by a conveyor or material handling system. There also would be the need to establish the rail loading facility prior to the main construction programme and remove and/or remediate the sites upon completion. This would involve many HGV movements and could require a new unloading facility near the quarry or end use with associated HGVs for this final leg of the movement.

5.6. With the provision of the loading facility at the tunnel excavation site, there would be a need to undertake significant cutting into Ben Cruachan to provide an open and level facility for the associated rail transfer infrastructure and rail passing loop.

5.7. Based on this appraisal of marine- and rail-based transportation strategies for the excavated construction material from the project, the most suitable solution is considered to be the existing proposed solution (as per the TA) of using HGVs for the whole trip.

5.8. In summary, the adoption of a marine- or rail-based transportation strategy for excess excavated construction material from the Cruachan Expansion Project would not bring environmental, engineering, safety, societal or economic benefits to the proposals given the significant impacts of the provision of transfer facilities when considering the minor reduction to movement travel distances. HGV movements are still likely to be required for some legs of the journeys. The adoption of an HGV movement strategy is considered most appropriate and is expected to be able to be managed with the adoption of appropriate conditions of consent for dilapidation reports and remediation works to the structural integrity of the infrastructure.

Further Environmental Information

Appendix 5 Scottish Forestry

Martin, Alexa

From: Martin, Alexa
Sent: 28 July 2022 15:08
To: Elaine.Jamieson@forestry.gov.scot
Cc: Fraser, Lynsey; Szylak, Stuart; Econsents_Admin@gov.scot
Subject: RE: 20220704 SF response - Cruachan Expansion Project

Dear Elaine

Thank you for your enquiry regarding the Section 36 consent application for the Cruachan Expansion Project and impact on woodland resulting from the proposals.

For the avoidance of doubt, there is no proposed loss of woodland and therefore a standalone woodland and forestry chapter has not been prepared as part of the EIA. Effects and impact on trees have however been assessed in Chapter 8 Ecology, and Chapter 11 Landscape and Visual Amenity.

Impact on woodland has been considered in Chapter 8 Ecology. To inform that chapter, a desk study was undertaken to anticipate potential ecological sensitivities associated with the site. This included reviewing records of ancient woodland (up to 2km from the site) and a review of statutory designated sites available through NatureScot Sitelink. That review identified woodland habitats present along the access track corridor only and not at either the lower works or the upper works. Table 8.9 summarises the likely construction phase impacts and effects on the Loch Etive Woods SAC, Coille Leitire SSSI and Ancient Woodland. Effects are from works to widen the dam access track, and for all works no significant effects are predicted.

A key premise of the proposed development is, where possible, the retention of existing trees to help limit the visual appearance of construction works and proposed features, particularly woodland included on the Inventory of Ancient and Long Established Woodland. This is covered in Chapter 3 at paragraph 3.3.6. As detailed designs of the proposals are developed more information about individual tree loss and planting as part of any landscaping proposals will become available and we will be happy to share and discuss these with you.

St. Conan's Road to the Dam via the existing access road (road improvement work)

The widening of the existing Access Track will directly affect habitats within the boundary of the Loch Etive Woods SAC, however in practice, these are track-edge, non-wooded habitats and it is likely that their overlap with the small areas proposed for widening are as a result of the precision of the GIS shapefile available for SAC boundaries. By association, given that their boundaries are identical, no significant effects are also predicted for the Coille Leitire SSSI.

As with the GIS data available for SSSI and SAC boundaries, there are numerous digitising discrepancies associated with the Ancient Woodland Inventory dataset. In this instance, Ancient Woodland is shown covering a small part of the existing Access Track within the Site. This has meant that the direct habitat loss calculations show an impact on c. 0.20 ha of ancient woodland, whereas in practice no such woodland will be affected because these areas are either already access track or not wooded. Therefore, no significant impacts on ancient woodland are anticipated as set out in Table 8.9 of the EIA Report.

Lower Works area (Loch Awe)
Some individual trees on the banks of Loch Awe (between the A85 and Loch Awe) will require to be removed to accommodate the construction of the new quayside and main access tunnel. This area is located outside the SAC / SSSI which is contained to the north of the railway line. This is covered in Chapter 11 Landscape and Visual Amenity at paragraph 11.8.4. Any trees removed will be replaced like for like and this will be detailed in a Habitat Restoration and Landscape Mitigation Plan which will be produced prior to the commencement of works. As designs are indicative, a landscaping plan has yet to be produced but this may be a condition attached to any forthcoming consent and we will produce that at the appropriate design stage.

Upper works (Cruachan Reservoir)
There are no trees in this area and the works are remote from the SAC / SSSI.

Trust this response addresses your queries but please get in touch if you require anything further.

Regards,

Alexa

Alexa Martin MRTPI
Senior Planner

5th Floor, Lomond House, 9 George Square, Glasgow G2 1DY
Direct: +44 (0)141 352 2377
alexa.martin@stantec.com

From: Elaine.Jamieson@forestry.gov.scot <Elaine.Jamieson@forestry.gov.scot>
Sent: 04 July 2022 09:01
To: Econsents_Admin@gov.scot
Cc: Martin, Alexa <Alexa.Martin@stantec.com>; Fraser, Lynsey <Lynsey.Fraser@stantec.com>
Subject: 20220704 SF response - Cruachan Expansion Project

Dear Alan,

Thank you for consulting us on the above proposal.

Scottish Forestry responded to the scoping exercise on 20.7.21. I have looked through the main EIA report, but have been unable to find reference to the Scottish Government's policy on control of woodland removal or the UK Forestry Standard. It maybe that I have missed these in my document search and so a pointer would be very helpful.

As well as the relevant policy and standard above, it would be helpful if the applicant to direct me to:

1. where woodland loss is summarised and identified on a map
2. and where the compensatory planting scheme is discussed and mapped

I will of course be happy to discuss directly with the applicant.

Kind regards
Elaine

Elaine Jamieson
Operations and Development Officer
Scottish Forestry

Perth & Argyll Conservancy | Upper Battleby, Redgorton | Perth | PH1 3EN
Mobile: 07909 893792
elaine.jamieson@forestry.gov.scot

Website: forestry.gov.scot
@scotforestry

Scottish Forestry / Coilltearachd na h-Alba

Scottish Forestry is the Scottish Government agency responsible for forestry policy, support and regulation.

In light of the ongoing public health advice to reduce unnecessary social contact during the outbreak of Covid-19, we have activated our Business Continuity Plan. More information can be found on our website.

BRAVE values are the roots that underpin Scottish Forestry, to create a workplace where our staff, and the people we work with, feel valued, supported and respected.

Be professional, **R**espect others, **A**ct with honesty and integrity, **V**alue teamwork and collaboration and **E**ncourage innovation and creativity.

From: Brogan A (Alan) <Alan.Brogan@gov.scot> **On Behalf Of** Econsents Admin
Sent: 02 June 2022 09:59
To: planning.sw@sepa.org.uk; argyll_outerhebrides@nature.scot; ''HMConsultations@hes.scot' (HMConsultations@hes.scot)' <HMConsultations@hes.scot>; Erskine A (Andrew) <Andrew.Erskine@transport.gov.scot>; Bridcut E (Emily) (MARLAB) <Emily.Bridcut@gov.scot>; Jamieson E (Elaine) <Elaine.Jamieson@forestry.gov.scot>; h.mauchlen@bhs.org.uk; radionetworkprotection@bt.com; aerodromes@caa.co.uk; DIO-Safeguarding-Statutory@mod.gov.uk; brian@fms.scot; info@argyllfisheriestrust.co.uk; cm@argyllfisheriestrust.co.uk; robert.younger@fishlegal.net; stuart@mountaineering.scot; scotland.planning@rspb.org.uk; info@scotways.com; PlanningConsultations@scottishwater.co.uk; bwilson@scottishwildlifetrust.org.uk; beryl@chway.plus.com; assetprotection@nationalgrid.com; info@visitscotland.com; AssetProtectionScotland@networkrail.co.uk; hugh.mcbrien@glasgow.gov.uk; Community Council <gandiccouncil@gmail.com>; chriscowley2015@gmail.com; connelcommunitycouncil@gmail.com; marrian@hotmail.co.uk; davie@davidsloss.co.uk; inveraray@btinternet.com
Cc: Martin, Alexa <Alexa.Martin@stantec.com>; Fraser, Lynsey <Lynsey.Fraser@stantec.com>; Econsents Admin <Econsents_Admin@gov.scot>
Subject: Electricity Act 1989 section 36: consultation - application to construct and operate the Cruachan Expansion Project pumped storage power station

Dear Sir/Madam,

ELECTRICITY ACT 1989

THE ELECTRICITY WORKS (ENVIRONMENTAL IMPACT ASSESSMENT) (SCOTLAND) REGULATIONS 2017

APPLICATION FOR CONSENT UNDER SECTION 36 OF THE ELECTRICITY ACT 1989 FOR CONSTRUCTION AND OPERATION OF THE CRUACHAN EXPANSION PROJECT WITHIN THE PLANNING AUTHORITY OF ARGYLL AND BUTE COUNCIL

Stantec UK Limited on behalf of Drax Cruachan Expansion Limited ("the Company") has submitted an application under section 36 of the Electricity Act 1989 for the Scottish Ministers' consent to construct and operate the Cruachan Expansion Project on land around and to the east of the existing Cruachan pumped storage hydro power station site, between the northern banks of Loch

Awe in Argyll and Bute, and Cruachan reservoir (reservoir National Grid Reference NN 080 282). The proposal is entirely within the planning authority of Argyll and Bute Council. The proposed development would provide up to 600MW of generating capacity from stored potential energy, and is subject to Environmental Impact Assessment (EIA). An EIA report has been produced and will be taken into consideration in determining the application.

In accordance with the Electricity (Applications for Consent) Regulations 1990, and the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 ('EIA regulations'), details of the application have been published in the national and local press. The application and EIA report has been made available by the Company on their application website: https://www.cruachanexpansion.com/s36-application/

Additionally a hard copy of the application and the EIA report has been deposited for public inspection at the Cruachan Visitor Centre, Dalmally..

Consultation

The Company have sent you a copy of the application and the EIA report for your consideration. If you have not received this, and cannot access the documentation on any of the websites listed on this email, please contact Stantec by telephone on 0141 352 2360 or by email at getintouch@cruachanexpansion.com.

The EIA regulations allow at least 30 days for responses to this consultation. As a statutory consultee or an organisation likely to be concerned by the proposed development, I would be grateful for your consideration of the application and the EIA report. Please provide your representations regarding the proposal by **4th July 2022**.

The application and all documentation, including the EIA report, can be viewed at https://www.energyconsents.scot/ApplicationDetails.aspx?cr=ECU00004492

Or on the Scottish Government's Energy Consents Unit website homepage www.energyconsents.scot by:

- clicking on ***Search*** tab; then,
- clicking on ***Simple Search*** tab; then,
- typing **Cruachan** into ***Search by Project Name*** box then clicking on ***Go***;
- then clicking on **ECU00004492** and then click on ***Documents*** tab.

Should you have any difficulties accessing the documents or if you require copies in a specific format please let me know.

Please submit your response by email to EconsentsAdmin@gov.scot

Please note reminders are not issued by Energy Consents, therefore if we have not received your comments by 4th July 2022, and you have not contacted me to request an extension to that date before 4th July 2022, I will assume you have no comments to make.

Regards

Alan Brogan | Team Leader | Energy Consents Unit
Scottish Government | 4th Floor, 5 Atlantic Quay | 150 Broomielaw | Glasgow, G2 8LU
Tel: 0131 244 1241 Mob: 07733 308485
To view our current casework please visit **www.energyconsents.scot**

Scottish Government
Riaghaltas na h-Alba
gov.scot

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Further Environmental Information

Appendix 6 BT

Martin, Alexa

From: Szylak, Stuart
Sent: 11 November 2022 16:57
To: James.McKenzie@gov.scot
Cc: Econsents_Admin@gov.scot; Steve Marshall; Fraser, Lynsey; Martin, Alexa
Subject: FW: Electricity Act 1989 section 36: consultation - application to construct and operate the Cruachan Expansion Project pumped storage power station - WID11877 - REPLY BY 4TH JULY

Good afternoon James,

Please see below response from BT confirming no impact of the proposed development on point-to-point microwave radio links.

Many thanks

Stuart

From: radionetworkprotection@bt.com <radionetworkprotection@bt.com>
Sent: 11 November 2022 15:17
To: Szylak, Stuart <Stuart.Szylak@stantec.com>
Subject: Electricity Act 1989 section 36: consultation - application to construct and operate the Cruachan Expansion Project pumped storage power station - WID11877 - REPLY BY 4TH JULY

OUR REF :- WID11877

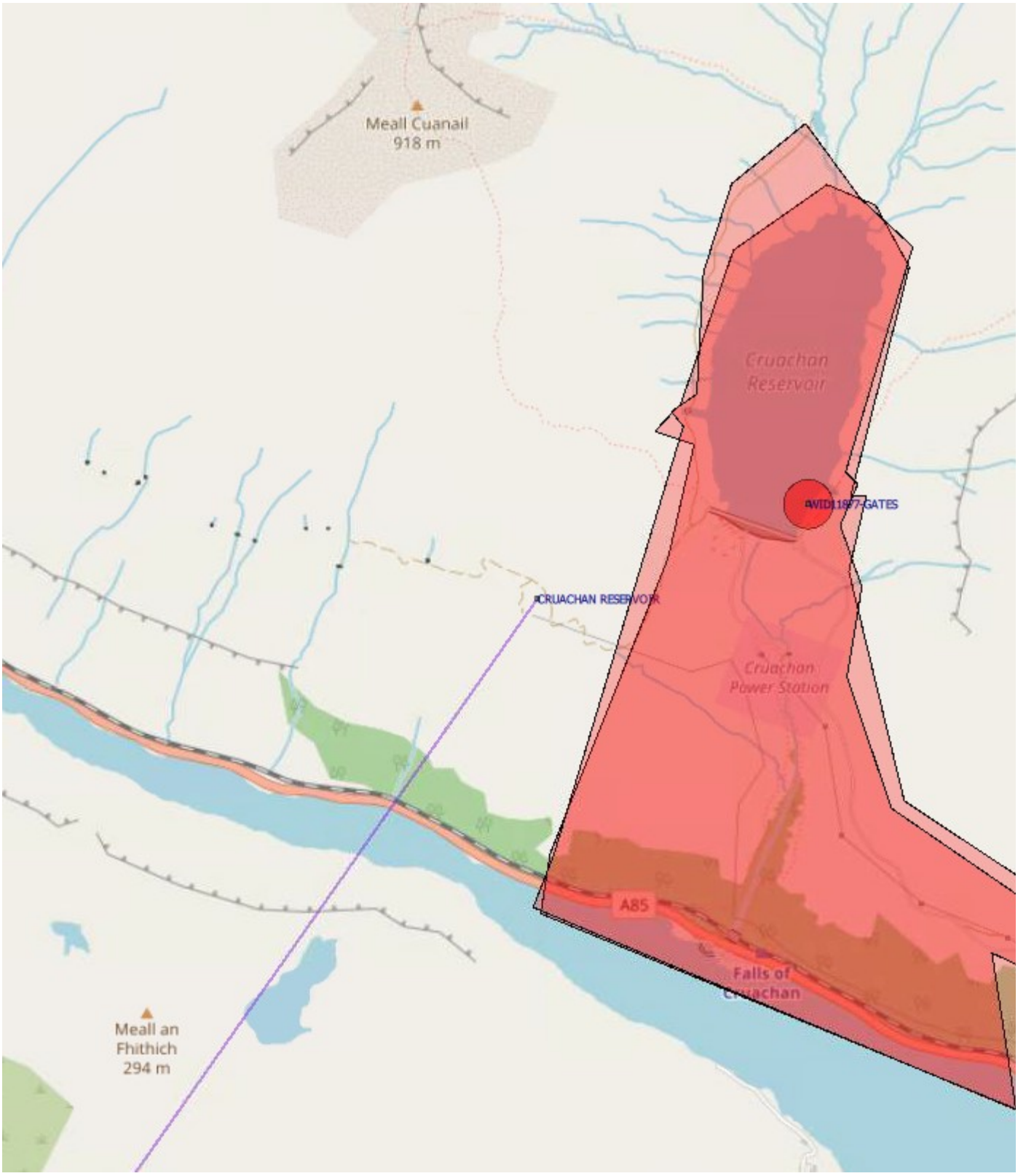
Good Afternoon Stuart

Thank you for your email dated 07/11/2022.

We have studied this proposed development, specifically the position of the 13m Gate hoist with respect to EMC and related problems to BT point-to-point microwave radio links.

The conclusion is that, the development indicated should not cause interference to BT's current and presently planned radio network.

Regards
Chris



From: Szylak, Stuart <Stuart.Szylak@stantec.com>
Sent: 07 November 2022 07:56
To: radionetworkprotection <radionetworkprotection@bt.com>; James.McKenzie@gov.scot
Cc: Alan.Brogan@gov.scot; Martin, Alexa <Alexa.Martin@stantec.com>; Fraser, Lynsey <Lynsey.Fraser@stantec.com>; Econsents_Admin@gov.scot
Subject: RE: Electricity Act 1989 section 36: consultation - application to construct and operate the Cruachan Expansion Project pumped storage power station - WID11877 - REPLY BY 4TH JULY

You don't often get email from stuart.szylak@stantec.com. Learn why this is important

Good morning James.

FAO: Laura Taylor, Engineering Services - Radio Planning
BT ref: **WID11877**

Further to BT's email of 30 June to the Government's Energy Consents Unit requesting further details I am pleased to attach further information on behalf of the applicant. The response related to potential impact to the BT point-to-point microwave radio links in the vicinity of Radio Link 904575 from Kilcheran TE to Cruachan Reservoir.

As with the existing hydro power station at this location most of the proposed structures will be underground. There will only be a few new structures above ground and the most relevant in your case will be the proposed gate hoist structure at the upper intake, near the existing dam at Cruachan Reservoir. This new structure is located at:

Grid Reference	X (Eastings)	Y (Northings)	Latitude	Longitude
NN 08193 28216	208193	728216	56.407115	-5.1102662

Attached is a plan and elevation of this structure, which shows its height as approximately 13m high. The attached visualisation (Figure 1.8d) provides a montage of the proposed structure as it would sit in the landscape.

I trust that this is sufficient information to allow you to complete your assessment, but please get in touch if you require any other details.

Many thanks

Stuart

Stuart Szylak BSc(hons)
Associate Environmental Planner

Edinburgh (Charlotte Lane) SCT Office
stuart.szylak@Stantec.com

Mobile: +44 (0) 7843819022

Stantec

From: radionetworkprotection@bt.com <radionetworkprotection@bt.com>
Sent: 30 June 2022 15:17
To: Econsents_Admin@gov.scot
Cc: Alan.Brogan@gov.scot; radionetworkprotection@bt.com
Subject: RE: Electricity Act 1989 section 36: consultation - application to construct and operate the Cruachan Expansion Project pumped storage power station - WID11877 - REPLY BY 4TH JULY

OUR REF; WID11877

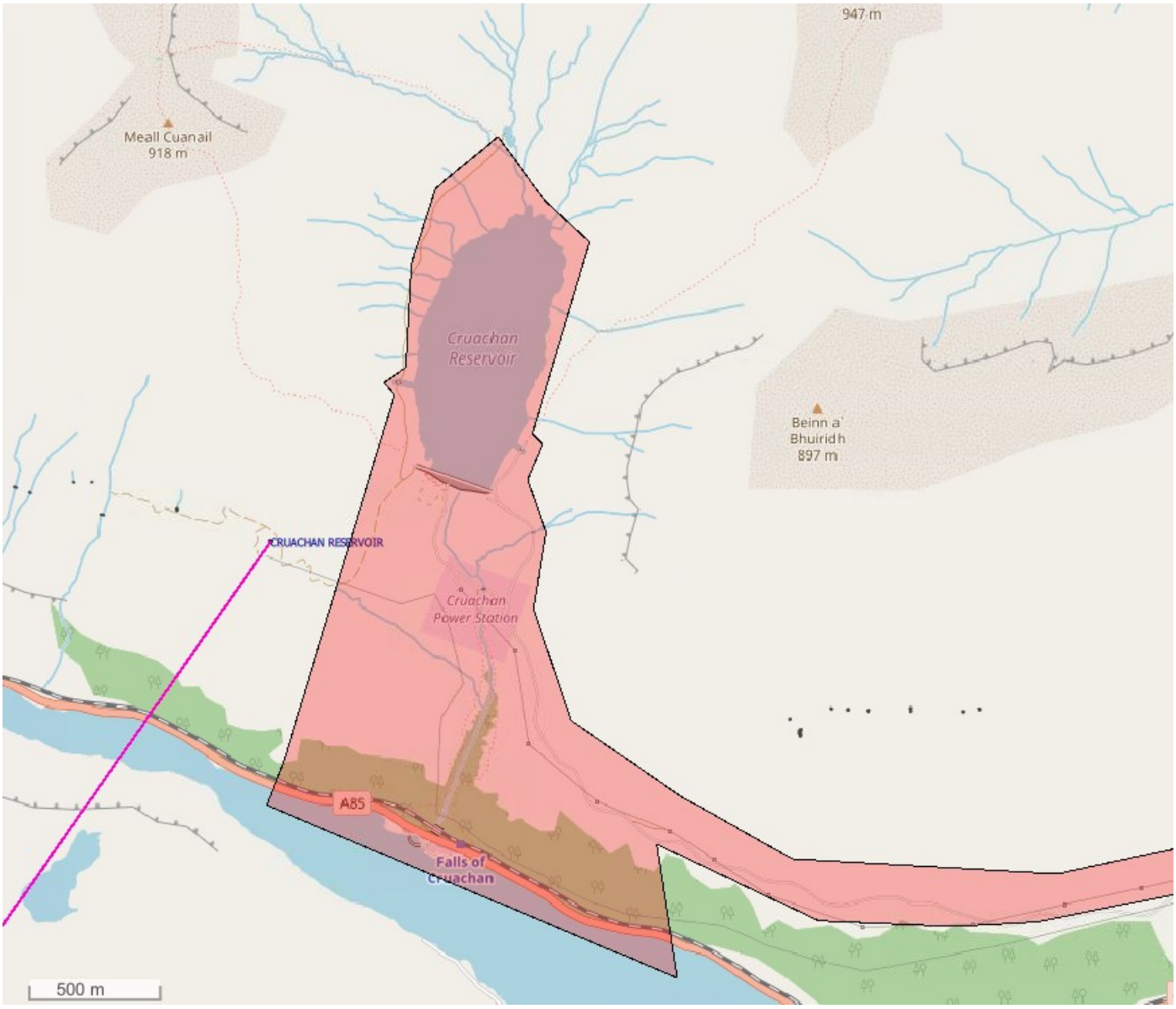
Dear Sir/Madam

Thank you for your email dated 02/06/2022.

We have studied this Cruachan Expansion Project proposal with respect to EMC and related problems to BT point-to-point microwave radio links.

The conclusion is that, the project is close to BT Radio Link 904575 from Kilcheran TE to Cruachan Reservoir. To make sure this project does not cause interference to BT's radio network can you please supply details of of any new structures within this development and include heights and grid references for these structures so this can be assessed.

I have performed a rough outline of your project in relation to our Radio Link and this can be seen in the image below.



Please direct all queries to radionetworkprotection@bt.com

Kind regards
Laura Taylor
Engineering Services - Radio Planning
Networks

From: Alan.Brogan@gov.scot <Alan.Brogan@gov.scot> **On Behalf Of** Econsents_Admin@gov.scot
Sent: 02 June 2022 09:59
To: planning.sw@sepa.org.uk; argyll_outerhebrides@nature.scot; HMConsultations@hes.scot; Andrew.Erskine@transport.gov.scot; Emily.Bridcut@gov.scot; Elaine.Jamieson@forestry.gov.scot; h.mauchlen@bhs.org.uk; radionetworkprotection <radionetworkprotection@bt.com>; aerodromes@caa.co.uk; DIO-Safeguarding-Statutory@mod.gov.uk; brian@fms.scot; info@argyllfisheriestrust.co.uk; cm@argyllfisheriestrust.co.uk; robert.younger@fishlegal.net; stuart@mountaineering.scot; scotland.planning@rspb.org.uk; info@scotways.com; PlanningConsultations@scottishwater.co.uk; bwilson@scottishwildlifetrust.org.uk; beryl@chway.plus.com; assetprotection@nationalgrid.com; info@visitscotland.com; AssetProtectionScotland@networkrail.co.uk; hugh.mcbrien@glasgow.gov.uk; gandiccouncil@gmail.com; chriscowley2015@gmail.com; connelcommunitycouncil@gmail.com; marrian@hotmail.co.uk; davie@davidsloss.co.uk; inveraray@btinternet.com
Cc: Alexa.Martin@stantec.com; Lynsey.Fraser@stantec.com; Econsents_Admin@gov.scot
Subject: Electricity Act 1989 section 36: consultation - application to construct and operate the Cruachan Expansion Project pumped storage power station - WID11877 - REPLY BY 4TH JULY

Dear Sir/Madam,

ELECTRICITY ACT 1989

THE ELECTRICITY WORKS (ENVIRONMENTAL IMPACT ASSESSMENT) (SCOTLAND) REGULATIONS 2017

APPLICATION FOR CONSENT UNDER SECTION 36 OF THE ELECTRICITY ACT 1989 FOR CONSTRUCTION AND OPERATION OF THE CRUACHAN EXPANSION PROJECT WITHIN THE PLANNING AUTHORITY OF ARGYLL AND BUTE COUNCIL

Stantec UK Limited on behalf of Drax Cruachan Expansion Limited (“the Company”) has submitted an application under section 36 of the Electricity Act 1989 for the Scottish Ministers’ consent to

construct and operate the Cruachan Expansion Project on land around and to the east of the existing Cruachan pumped storage hydro power station site, between the northern banks of Loch Awe in Argyll and Bute, and Cruachan reservoir (reservoir National Grid Reference NN 080 282). The proposal is entirely within the planning authority of Argyll and Bute Council. The proposed development would provide up to 600MW of generating capacity from stored potential energy, and is subject to Environmental Impact Assessment (EIA). An EIA report has been produced and will be taken into consideration in determining the application.

In accordance with the Electricity (Applications for Consent) Regulations 1990, and the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 ('EIA regulations'), details of the application have been published in the national and local press. The application and EIA report has been made available by the Company on their application website: https://www.cruachanexpansion.com/s36-application/

Additionally a hard copy of the application and the EIA report has been deposited for public inspection at the Cruachan Visitor Centre, Dalmally..

Consultation

The Company have sent you a copy of the application and the EIA report for your consideration. If you have not received this, and cannot access the documentation on any of the websites listed on this email, please contact Stantec by telephone on 0141 352 2360 or by email at getintouch@cruachanexpansion.com.

The EIA regulations allow at least 30 days for responses to this consultation. As a statutory consultee or an organisation likely to be concerned by the proposed development, I would be grateful for your consideration of the application and the EIA report. Please provide your representations regarding the proposal by **4th July 2022**.

The application and all documentation, including the EIA report, can be viewed at https://www.energyconsents.scot/ApplicationDetails.aspx?cr=ECU00004492

Or on the Scottish Government's Energy Consents Unit website homepage www.energyconsents.scot by:

- clicking on ***Search*** tab; then,
- clicking on ***Simple Search*** tab; then,
- typing **Cruachan** into ***Search by Project Name*** box then clicking on ***Go***;
- then clicking on **ECU00004492** and then click on ***Documents*** tab.

Should you have any difficulties accessing the documents or if you require copies in a specific format please let me know.

Please submit your response by email to EconsentsAdmin@gov.scot

Please note reminders are not issued by Energy Consents, therefore if we have not received your comments by 4th July 2022, and you have not contacted me to request an extension to that date before 4th July 2022, I will assume you have no comments to make.

Regards

Alan Brogan | Team Leader | Energy Consents Unit
Scottish Government | 4th Floor, 5 Atlantic Quay | 150 Broomielaw | Glasgow, G2 8LU
Tel: 0131 244 1241 Mob: 07733 308485

To view our current casework please visit **www.energyconsents.scot**

Scottish Government
Riaghaltas na h-Alba
gov.scot

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This e-mail (and any files or other attachments transmitted with it) is intended solely for the attention of the addressee(s). Unauthorised use, disclosure, storage, copying or distribution of any part of this e-mail is not permitted. If you are not the intended recipient please destroy the email, remove any copies from your system and inform the sender immediately by return. Communications with the Scottish Government may be monitored or recorded in order to secure the effective operation of the system and for other lawful purposes. The views or opinions contained within this e-mail may not necessarily reflect those of the Scottish Government.

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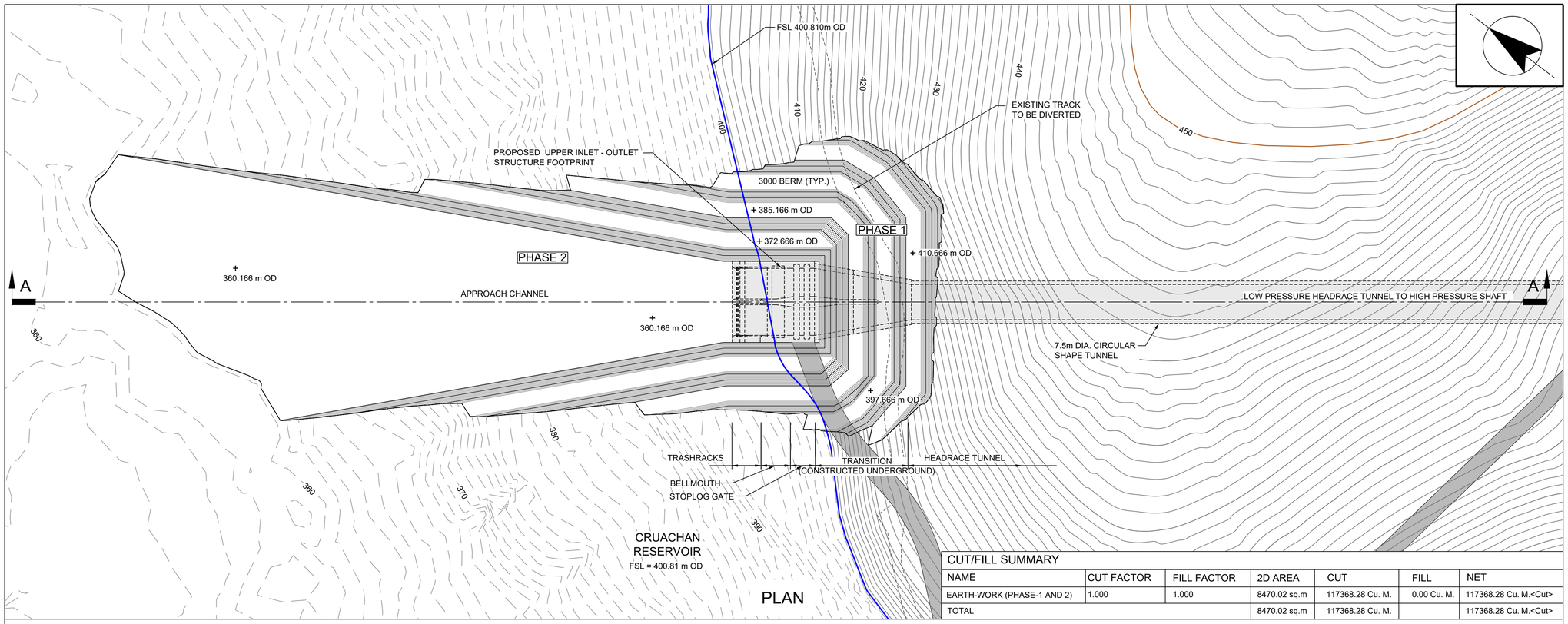
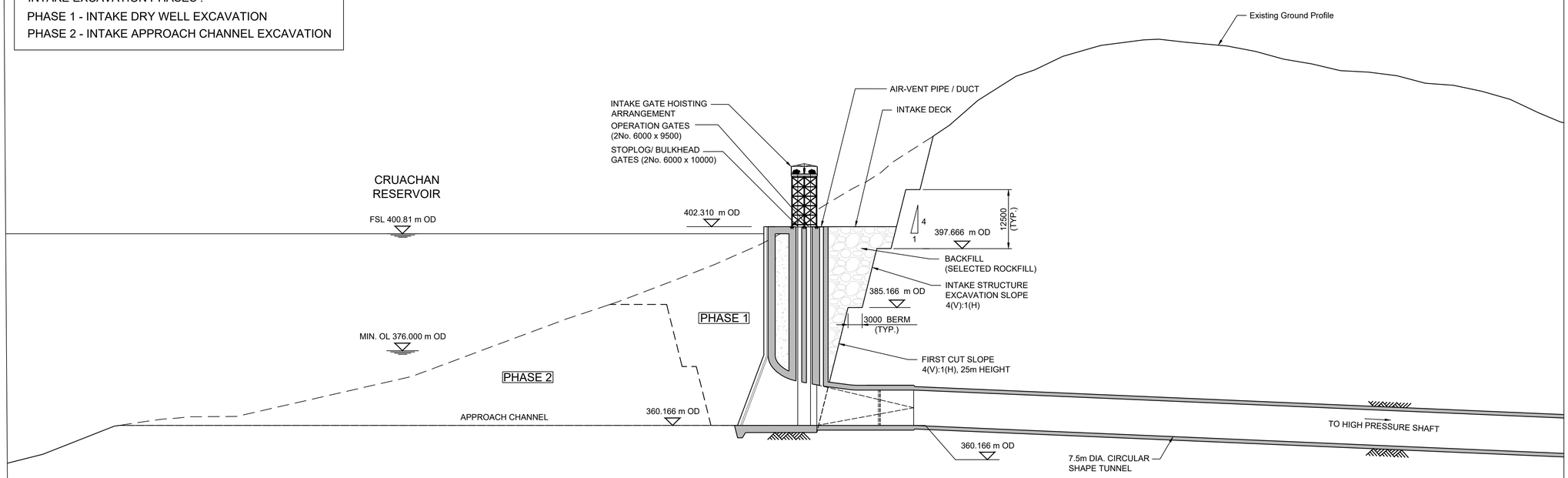


CUT/FILL SUMMARY						
NAME	CUT FACTOR	FILL FACTOR	2D AREA	CUT	FILL	NET
EARTH-WORK (PHASE-1 AND 2)	1.000	1.000	8470.02 sq.m	117368.28 Cu. M.	0.00 Cu. M.	117368.28 Cu. M.<Cut>
TOTAL			8470.02 sq.m	117368.28 Cu. M.		117368.28 Cu. M.<Cut>

INTAKE EXCAVATION PHASES :
PHASE 1 - INTAKE DRY WELL EXCAVATION
PHASE 2 - INTAKE APPROACH CHANNEL EXCAVATION



SECTION A-A

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES UNLESS SHOWN OTHERWISE.
2. THIS IS A CONCEPT PHASE DRAWING TO ILLUSTRATE THE PROJECT BASE CASE. ALL DIMENSIONS AND ELEVATIONS ARE APPROXIMATE AND WILL BE REVIEWED AND UPDATED AS PROJECT DESIGN STUDIES CONTINUE. ALL CONCEPTS, DETAILS, DIMENSIONS AND ELEVATIONS INDICATED ON THIS DRAWING WILL REQUIRE FURTHER REFINEMENT DURING A SUBSEQUENT DESIGN PHASE.

LEGEND

EXISTING CONTOURS

BATHYMETRIC CONTOURS

REFERENCE

331201086/01/C/0710 PLAN AND SECTION - PHASE 1 - EXCAVATION

SCALE 1 : 500

m10 0 40m

CURRENT VERSION INFORMATION

B. HEADRACE TUNNEL DIAMETER UPDATED.

DATE	DRWN	CHKD	REVD	VER	REASON FOR ISSUE
28.02.22	PPS	SS	CS	B	FOR INFORMATION
01.02.21	RRS	SS	CS	A	FOR INFORMATION

DRAX CRUACHAN EXPANSION LTD
CRUACHAN 2

UPPER INTAKE STRUCTURE
PLAN AND SECTION
PHASE 2 - EXCAVATION
OPTION-5

drax

Stantec

CONTRACT NO.	SCALE	MASTER SIZE
01	1:500	A1
DRAWING NO. 331201086/01/C/0711		VERSION B

Cruachan Expansion Project

Figure 11.8d – Visualisation of Proposed Upper Intake Structure from Cruachan Reservoir Track: Photomontage (10 Years After Completion)

NOTE: This photomontage shows the anticipated situation during operation, after 10 years. The positioning and growth of vegetation is estimated and indicative.

OS reference:	207840 E 728343 N	Camera:	Canon EOS 5D mk II	Horizontal field of view:	53.5° (planar projection)
Ground level:	414.9 m AOD	Lens:	50mm (Canon EF 50mm f/1.4)	Principal distance:	812.5 mm
Direction of view:	114°	Camera height:	1.5m AGL	Paper size:	841 x 297 mm (half A1)
Distance to Proposed Development:	380.1 m	Date and time:	02/03/2022 13:27	Correct printed image size:	820 x 260 mm

Drawing No. - 121001-D-LV11.8d-1.0.0 Date - 12.05.2022

Stantec drax ash

Further Environmental Information

Appendix 7 Argyll District Salmon Fishery Board

Cruachan 2
ADSFB Comments and Responses

Summary of Gavia Environmental Ltd responses to issues raised by the Argyll District Salmon Fishery Board in their consultee response dated 28 June 2022

1. **Survey work does not fully cover concerns of entrapment of fish, specifically salmon smolts as they migrate past the scheme intake in spring.**

Migration passage and attraction and entrainment of fish being held up during the up or downstream passage is possible. However, pre- and post-construction monitoring, could be considered, and that data incorporated into any wider catchment studies undertaken by ADSFB *et al.* It is considered that the scope of this lies outwith the S36 application remit as any study of the passage of salmonids in the Loch Awe system would require wide reaching surveys outside client land ownership boundaries.

2. **Electrofishing was limited, and is not appropriate for large standing waters.**

Destructive measures were discounted at the proposal stage as not representing best practice, and whilst eDNA would give limited data on fish species it would not fully inform about relative abundance or population.

3. **Fish populations are insufficiently described.**

It is true that we currently do not know for certain as to the composition or size of the fish populations in Loch Awe. To do so would involve gill netting, or tagging spawning fish prior to passage and monitoring work to determine what fish species are present. There could be some potential in using hydroacoustic monitoring and eDNA techniques, but this would not reveal anything regarding population sizes. Gill-netting could have been used and this would have provided both species assemblage and relative population estimates, but this would have resulted in the need to sacrifice fish for those studies; such destructive measures were discounted at the proposal stage as not representing best practice.

4. **The potential for drawing fish into the intake of the scheme is not considered.**

Drax has no records of fish fouling of the CW screens; all organic debris is plant derived matter.

Table 8.14 could perhaps be made clearer to highlight the difference between generation impacts (causing fish to be attracted to turbulence), and when water is being drawn (potentially causing fish to be drawn in to the intake).

EIAR 8.10.38: Certain design elements may be required in order to ameliorate some of the operational phase effects of the Proposed Development on fish, if considered appropriate, including minimising the risk of drawing fish into the intake of the scheme. These will include:

- An appropriately designed fish guidance system may be considered in consultation with stakeholders to guide fish away from water movement/turbulence which may attract them and leave them open to increased risks of entrapment and predation at the inlet/outlet (lower control works).
- Screens with appropriately sized apertures to cover the inlet/outlet pipes will be implemented to prevent fish from entering into the underground waterway system at Loch Awe and Cruachan reservoir to reduce the risks of fish entrapment, injury and mortality or translocation. The screens will require regular inspection and maintenance to prevent blockage / damage from foliage and debris. As stated above Drax has no records for fish fouling of the screens.

5. The report considers limited potential for salmonid spawning in Loch Awe (correct) but not the historical population in Cruachan Reservoir which has come about due to entrapment from the current scheme.

No suitable salmonid spawning habitat was found within survey boat transects on Cruachan Reservoir. Furthermore, the existing operation of Cruachan, which results in fluctuating water levels, impact littoral zone spawning success as the wetted area changes diurnally. The operational regime makes this a very challenging environment for salmonid populations and their historic passage would present a challenging environment for any sustainable population, particularly given the dynamic fluctuations of the water levels. The lack of macrophytes and the relatively low densities of aquatic invertebrates also provides some further evidence of this, presenting minimal cover and food resource. Fish eDNA survey could however be used to define the species assemblages present.

Para 5.2.1 of the Cruachan 2 Freshwater Surveys Report Technical Appendix 8.3 states that: *'The results from the survey indicate that substrate composition for potential salmonid spawning habitat is either unsuitable or sub-optimal. This is due to either the substrate type being too large, not containing enough spawning substrate or the presence of sand and silt'*

Also in 8.5.42 of EIAR: In both Loch Awe and Cruachan Reservoir, the substrate type and composition were deemed to be unsuitable or sub-optimal for salmonid spawning. The main reasons for this were that the substrate was too large, there was insufficient substrate suitable for spawning, or the presence of sand and silt. Fish spawning habitat was therefore not included in the EcIA as an IEF.

6. 90 % of the Atlantic salmon smolts in the catchment migrate from the River Orchy and therefore will pass the intake for the scheme.

Yes, there is a risk of entrainment "holding up" during downstream migration of smolts, but there is a plethora of environmental factors that hold up smolts, for example, this year has been particularly strange with fish and bird migration significantly delayed throughout the UK. Entrainment around the intake/outfall is currently unquantified, meaning that it is a known unknown. Gavia Environmental Ltd is unaware of any current research data to support the number of smolts which are held up each year at the existing Cruachan intake/discharge.

7. **ADSFB needs to be assured that all measures are put in place to ensure that smolts and other fish are not drawn into the hydro scheme.**

Embedded mitigation in the form of fixed fish deflection technology from the intakes may be considered. Temporary netting during the smolt run has been considered, but discounted on the basis that it would present a risk to otter and diving birds attracted by the fish passage. Other devices have been considered, including underwater light systems and/or other engineering based systems e.g. a bubble barrier at a distance (to be confirmed) away from the intakes to deflect the smolts and thus minimise an "entrainment effect" if present.

AEL/GEL, 21 September 2022

Further Environmental Information

Appendix 8 Public Representations

Your Ref: ECU00004492
Our Ref: 50355

17th November 2022

James McKenzie
Energy Consents Unit
Scottish Government
4th Floor, 5 Atlantic Quay
150 Broomielaw
Glasgow
G2 8LU

By email to: James McKenzie James.McKenzie@gov.scot

Dear James,

The Electricity Works (EIA) (Scotland) Regulations 2017
Application For Consent Under Section 36 of the Electricity Act 1989 For Construction And Operation Of The Cruachan Expansion Project Within The Planning Authority Of Argyll And Bute Council
Applicant Response to Public Representations 001 & 002

In response to public representations received in relation to the above application I am pleased to respond on all the matters raised in such. This response is split into topic specific sections that are reflected in the public representations.

Spoil Removal

The main EIA Report states at paragraph 3.3.13 "*The Applicant has committed to not removing any spoil or rock from the upper works via the Dam access road. Instead, all spoil generated by the upper works will be dropped down the main tunnel shaft and penstocks and removed via the main access tunnel at Loch Awe*." Paragraph 5.1.5 of Appendix 9.1, Transport Assessment, recognises spoil will be exported via the Lower Control Works site at Loch Awe, as per the commitment mentioned above.

The impact assessment undertaken takes a robust approach to the proposed construction timetable and sequencing, to ensure the impacts of any unforeseen issues are included as part of the assessment. This therefore means that the EIA Report represents a 'worst case scenario', such as some spoil being removed via the Upper Control Works, however it is Drax's intention that spoil will not be removed via the Dam access road as per the statement in paragraph 3.3.13 of the EIA Report.

A full Site Waste Management Plan (SWMP) will likely be required as part of any consent. The SWMP will need to be specific about how waste and spoil will be managed, handled, reused or disposed of. It will be used as a control mechanism and its measures enforced by the relevant authorities

Cattle Grid Relocation

Relocation of the cattle-grid, towards the foot of the Dam access road/St Conans Road, is a matter that would require agreement with Castles Estates as landowner. Drax is happy to raise this issue with the land agents acting on behalf of Castles Estates with a view to relocating this specific cattle grid if possible.

Noise and Vibration Impacts at 1 Railway Cottage

1 Railway Cottage is identified as R3 (receptor 3). The predicted noise impacts are summarised within Tables 10.14 (construction works) and 10.15 (construction traffic) of the Noise and Vibration chapter of the EIA Report.

The impact assessment undertaken takes a robust approach to ensure the maximum potential impact from the scheme is assessed. This means that the EIA Report represents a 'worst case scenario'. For example, noisy activities for 'Surface Level Facilitation Works for Underground Construction' will be drilling of rock for the main access and tailrace tunnels. These activities are currently proposed to be circa 350m and 450m away from this property. However, for robustness, the assessment has assumed 50m, this being the distance to the edge of the red line boundary for the site. It is very unlikely to be the case that any form of drilling activity will take place in such close proximity to R3 but the EIA report undertaken has adopted a 'worst case scenario' for assessment purposes.

In relation to criteria for noise insulation and temporary re-housing during construction activities the British Standard BS 5228-1:2009+A1:2014 provides advice on this. Based on guidance provided with BS 5228-1 and the calculated worst-case construction noise levels during any phase of the proposed construction works at Cruachan, the noise threshold of 80 dB LAeq,T for temporary re-housing and noise insulation is not predicted to be exceeded at R3. LAeqT represents the 'equivalent average' sound level over a given time interval, T. Using the equivalent average makes it possible to define a fluctuating sound level with a single number.

The calculated construction noise levels and impacts at receptor R3, 1 Railway Cottage as reported in the EIA Report are shown in Table 1.

Table 1: Calculated Construction Noise Levels & Impacts at R3

Receptor	Site Preparation Works	Foundation Works & Substructure	Building Erection Works & Superstructure	Surface Level Facilitation Works for Underground Construction	Road Works	Landscaping Works
R3 – 1 Railway Cottage	66 dB $L_{Aeq,12hours}$	62 dB $L_{Aeq,12hours}$	63 dB $L_{Aeq,12hours}$	71 dB $L_{Aeq,12hours}$	67 dB $L_{Aeq,12hours}$	55 dB $L_{Aeq,12hours}$
	Moderate	Minor	Minor	Major	Moderate	Negligible

The technical criteria in BS 5228-1 states that, in relation to the need for noise insulation, over typical construction hours between 08:00 and 18:00 hours during weekdays the noise threshold is 75 dB LAeq,T. In relation to the trigger level for temporary rehousing over typical construction hours between 08:00 and 18:00 hours during weekdays the level is 80 dB LAeq,T.

Given the noise thresholds for the proposed works do not exceed the levels set out in the above British Standard, Drax would not propose to purchase the property as part of the project.

Prior to construction, the principal contractor will prepare a detailed plan on noise once the final design has been established and the technical and engineering methodologies agreed. For major projects such as this, a Noise Management Plan including details of the timing and methodology of any blasting associated with the development is needed. This will outline steps to be taken to reasonably minimise all principal sources of noise, and vibration activities that are likely to be audible at sensitive receptors. The noise management plan will include measures for liaison with local residents, and we shall of course continue to liaise with you as the project progresses.

We trust this letter addresses the queries raised in Representations 001 and 002 and would request that Mr MacBeath (001) and Mr Wolff (002) are made aware of our response.

Your sincerely,

Stuart Szylak
Associate Environmental Planner
on behalf of Stantec UK Ltd